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A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE.

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# ANNALS OF SURGERY

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## ORIGINAL MEMOIRS.

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### THE ANATOMY AND SURGERY OF THE INTERNAL DERANGEMENTS OF THE KNEE-JOINT.

BASED ON A STUDY OF 150 DISSECTED JOINTS AND THE LITERATURE.

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#### ANATOMY.

THE knee is a joint depending entirely upon ligaments for its strength. Disregarding the patella, there are only two small articular areas in contact in all positions of the limb. These areas are convex on the femoral side, and slightly concave, plain, or even convex on the tibial side. There is neither cup nor socket nor real concavity of any sort, though there is a short and shallow mortise-and-tenon effect produced by the projection of the tibial spines into the popliteal notch. The two bones with the articular cartilage left on and all the ligaments removed are in unstable equilibrium in all positions. This mechanical disadvantage and the arrangement of the lubricating apparatus which is at times inadequate, and at times an actual obstacle to the working of the joint, furnish the chief reasons why the knee is the most frequently deranged of all the joints in the human body.

The fresh articular surfaces differ somewhat in shape from the ends of the dried bones. The articular cartilage of the femur is thickest over the trochlear surface on which the patella slides. It is also thickened along the curve of the condyles over the area which has contact with the tibia, and from this thicker strip it thins out gradually towards the margins of the bone. This makes the trochlear groove appear shallower and the condylar surfaces rounder on the fresh than on dry specimens.

The articular surface of the external tibial tuberosity is distinctly convex from before backward, and shows but little concavity from the tip of its spine to its margins. The articular surface of the internal tuberosity is slightly concave in all diameters, but by no means corresponding to the convexity of the femoral condyle. Moreover its surface is not in a horizontal plane, but slopes decidedly from before backward, giving the internal femoral condyle a constant tendency to slip backward. The articular cartilage on the upper surface of the tibia is thickest for contact with the femur, and regularly thins out from this area in all directions. Except on the surfaces which face the interspinous space, both tibial spines are covered with articular cartilage clear to their tips. Braune and Fischer have demonstrated that the shape of these surfaces changes somewhat under pressure.

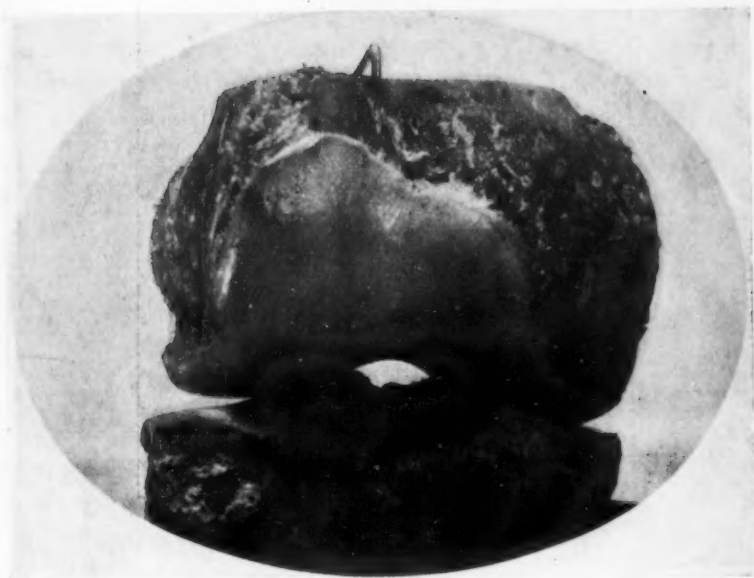
Of the ligaments which hold these two joint surfaces in contact in almost all positions of the limb, some things of interest have been noted beyond the usual text-book statements.

The anterior crucial has a smaller cross-section at its middle than at either end and appears to be weaker than the posterior crucial. In twenty-three joints out of forty noted it was joined towards its upper end by a very slender bundle of fibres from the anterior end of the external semilunar,\* and in six joints a small slip from the anterior crucial split off to join and be inserted with the posterior crucial.

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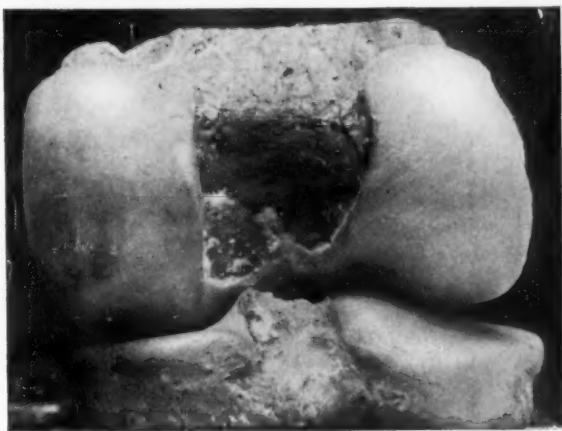
\* This differs from the experience of Testut and Mouret.

PLATE I.



Bones of right knee in extension, front view. Ligaments all removed. Position adjusted by comparison with a partially dissected joint.

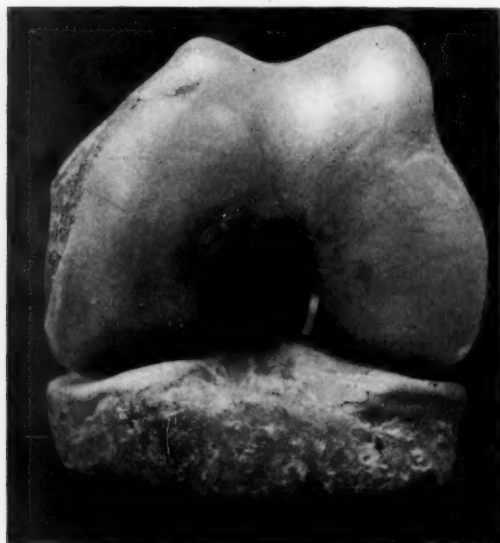
PLATE II.



Bones of right knee in extension, back view.



PLATE III.



Bones of right knee flexed to  $90^{\circ}$ , front view.

PLATE IV.



Bones of right knee flexed to  $90^{\circ}$ , back view.

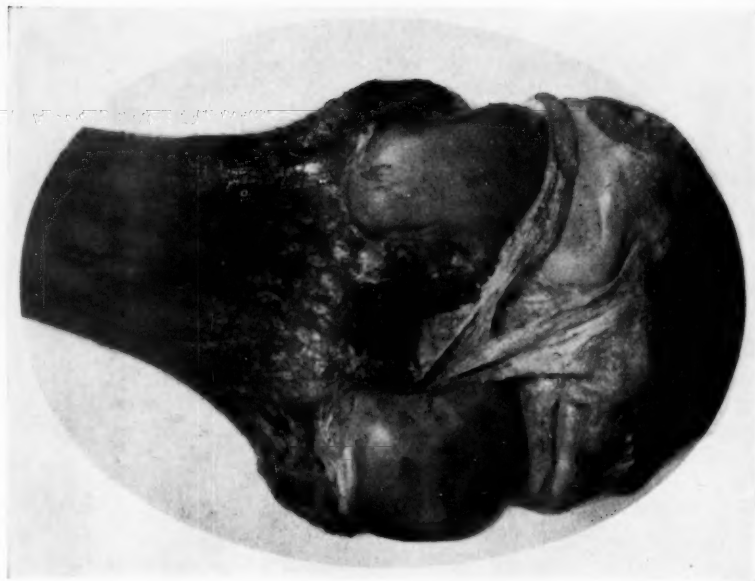


PLATE V.



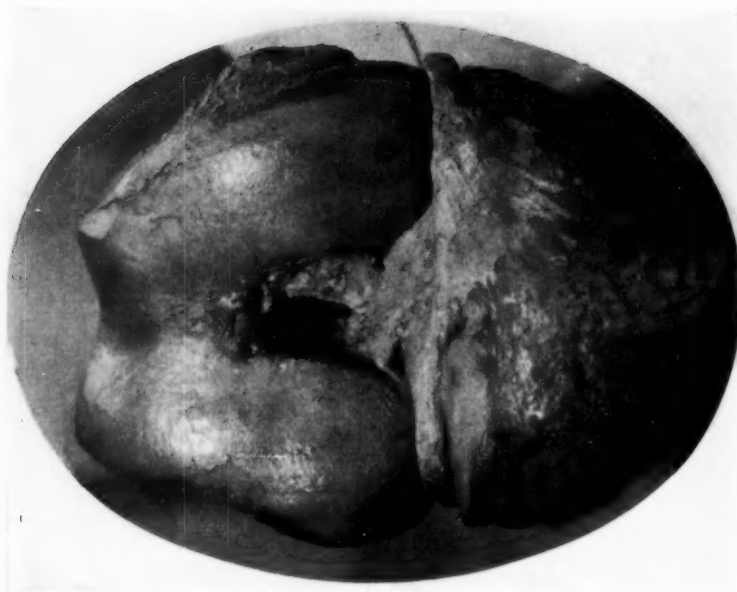
Right knee, joint extended, front view. Lateral ligaments removed, crucials and semilunars showing.

PLATE VII.



Same as Plate V, but flexed to 90°, front view.

PLATE VI.



Same as Plate V, back view.

The posterior crucial at its insertion on the femur is joined almost always—thirty-six times in forty—by a good-sized band from the external semilunar, which is more tense in extension than in flexion.

Between the two crucial ligaments where they cross and are continually rubbing, a bursa may be found which does not usually communicate with the general synovial cavity.

These ligaments are adjusted to limit extension,<sup>1</sup> to control the movements of the femur and tibia in the anteroposterior plane, to carry some of the weight when the leg is swinging clear of the ground, and possibly to assist in producing close contact of the joint surfaces in internal rotation.

The semilunar fibrocartilages may be considered as the semicircular remains of complete inter-articular fibrocartilage discs with the centres worn through, leaving sharp free edges directed towards the tibial spines, and a thick periphery still attached to the inside of the capsule.

Three specimens of the 150 joints examined showed external semilunars complete, except for a small opening against the tibial spine. The internal varies in width, but so far as known has never been found as a reasonably complete disc. Both are firmly blended at their peripheries with the capsule, fibres passing into them from above and from below. Both lose their layer of cartilage at their extremities, become fibrous bands, and blend with the tibial periosteum or become continuous with some ligament.

The external semilunar in front is mainly attached to the non-articular surface of the external tibial spine. Its peripheral attachment to the capsule is interrupted by the opening for the popliteus tendon. This opening is usually slightly wider above than below, measuring fifteen millimetres above and twelve millimetres below as an average in forty joints. It is always obliquely directed, the lower opening being internal.

Posteriorly the external semilunar sends its main attachment to the middle part of the interspinous space, and also sends a strong band to be attached parallel to the posterior crucial on the femur. These bands were noted as follows:

Inserted anterior to posterior crucial .....	11
Inserted posterior to posterior crucial .....	5
Split, one strand in front, the other behind .....	20
Absent .....	4

Sometimes these bands blended with one or the other crucial, and sometimes they remained distinct to their point of insertion.

The internal semilunar has no break in its peripheral attachment, but on the contrary is firmly attached to the internal lateral ligament which holds it very closely to the tibia. Posteriorly it sends a fibrous end in between the posterior crucial and the tibia, to be attached to the non-articular surface of the internal tibial spine, and in front it blends with the origin of the anterior crucial ligament in front of the internal spine.

In structure the semilunar fibrocartilages are composed of fibrous tissue, with fibres arranged parallel to the periphery, covered above and below with a layer of cartilage. The thickness of the structure at its periphery as compared with its free margin is due to a greater proportion of fibrous tissue rather than to any thickening of the cartilage layer, which is indeed thinner here than at the free border. On cross-section some vertical fibres of the capsule can be seen to pass into and blend with the horizontal fibrous core of the semilunar both from above and from below. The greater strength of the lower fibres, which are in no other way to be distinguished from the capsule, probably accounts for the separate name of "coronary ligaments."

The transverse ligament is a continuation of the semilunars and usually connects the two in front. It is not a constant affair of appreciable size. Its absence was noted in sixteen joints, and in eight it is recorded as threadlike out of seventy-three recorded. It may be a continuation of either semilunar. Five times it was continuous with the internal only and twice with the external. When this arrangement exists, its free end spreads out into the mass of fatty tissue

below the patella. This practically agrees with Higgins's observations,<sup>2</sup> and makes it difficult to agree with Pauzat's<sup>3</sup> conclusions as to its great importance.

At the inner side of the joint, the internal lateral ligament is firmly attached to the semilunar as before described, and at this point neither has motion independent of the other. On the outer side, the band of fibres called the anterior or long external lateral ligament has no connection with the outer semilunar, and frequently its synovial bursa is interposed. Internal and behind this, the posterior or short external lateral ligament, which is a part of the capsule, is separated from the semilunar by the opening through which the popliteus tendon passes.

Both semilunars have some freedom of movement independent of femur and tibia, though they only move with the joint capsule. The simplest description of their movements is to say that in flexion they move with the tibia, and in rotation with the femur. In full extension, they approach each other in their centres, and in flexion to a right angle or more their centres are somewhat separated. This is as might be expected from the divergence of the femoral condyles.

The external has much greater freedom of movement than the internal, lacking the restraint of anything like the short and powerful internal lateral ligament. Pauzat and others assert that their excursions in the joint are governed by muscular attachments; but the writer believes that their movement is entirely passive. They certainly move freely in a normal cadaveric knee.

The tibial surface exposed by the semilunars, when carrying no weight, is always larger than the surface of femur in contact in any normal position of the joint. When the knee is put under pressure in a vise, the external semilunar can be made to fit the external condyle snugly in extension, but in no other position. The internal cannot be made snug. In other words, the semilunars are not so well placed to carry the weight of the body, whether standing or with bent knees, as they are to assist the lateral ligaments of the opposite side,

and to limit the excursion of the condyles from the tibial spines.

For example, if the internal semilunar be removed with as little damage as possible to the capsule, the joint works well in flexion, rotation, and extension, until some force acts to bend the knee outward. Then it is evident that the external lateral ligaments are insufficient to prevent an increase over the normal motion in this direction. The same is true of forces acting to bend the knee inward after removal of the external semilunar. With the removal of both, this fact becomes still more evident, and the lateral motion of the knee is increased from about five degrees to fifteen degrees or more.

With both semilunars present, these lateral movements are resisted not only by the opposite lateral ligaments, but by the horizontal fibres of the semilunars, and the increased tension of the crucials as the femur and tibia are separated by the wedge of fibrocartilage. With a semilunar absent the corresponding femoral condyle is free to slip down away from the tibial spines, with nothing to stop it save a flexible guy on the other side of the joint.

In full extension there is probably little weight carried on the semilunars unless there be side pressure. With any lateral strain on the joint, the semilunar on the side *against* which the force is exerted becomes immensely important in preserving the stability of the joint. In flexion the internal condyle rolls back on to the internal semilunar if the leg be rotated out, and this comparatively fixed part of the cartilage probably sustains some weight under these conditions, though most of the pressure comes through the external condyle in this position.

A small but constant artery runs around the periphery of each cartilage where the capsular fibres blend with it.

The joint cavity is enclosed by a synovial membrane, external to which is a covering of fibrous tissue thickened in certain locations and added to in others by the endings of active or outgrown muscles.

Of the ligaments which may be considered thickenings

PLATE VIII.



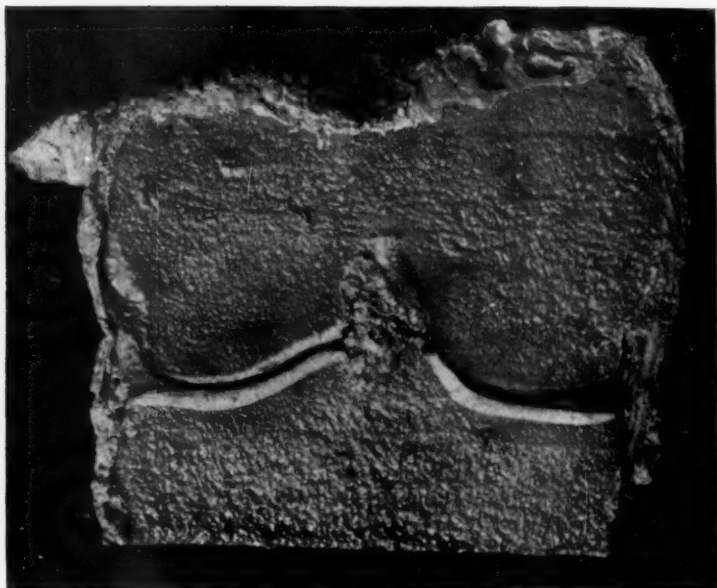
Same as Plate VII, back view.

PLATE IX.



Lower part of right capsule hardened in formalin. Femur removed, showing semilunar cartilages and crucial ligaments.

PLATE X.



Vertical transverse section through lateral ligaments left knee, joint extended.  
Front view of section.



of the capsule, the internal lateral is the strongest and shortest, and is said to be the vestige of a long adductor magnus tendon to the tibia.

On superficial dissection, it appears fan-shaped, with fibres radiating from the prominence on the internal femoral condyle. In horizontal sections the bulk of the fibres can be seen to pass almost directly downward to be attached to the floor and margins of the groove for the semi-membranosus on the tibia, while only the most superficial fibres have the radiating arrangement—an anterior set passing down under and almost as far as the gracilis tendon, while the posterior fibres swing around even behind the internal condyle into the posterior part of the capsule.

Its length as measured on the outside of a dissected joint is much greater than that of its shortest fibres which are in contact with the synovial membrane and the semilunar cartilage.

Its working length is, of course, no greater than that of these shortest fibres, which do not measure over three and one-half or four centimetres,—twelve joints measured.

The function of this ligament is to guard against strains tending to bend the knee inward, to prevent over-extension of the joint, to limit rotation of the leg and foot, and to assist in carrying the leg weight when the foot is off the ground. It also greatly limits the movements of the internal semilunar fibrocartilage.

The external portion of the capsule is supported by the long external lateral ligament, the popliteus and the biceps tendon, and consequently shows less thickening than the internal part.

The long external lateral ligament shows plainly its connection with the upper end of the peroneus longus, and is said to be a vestigial attachment of that muscle. It is long and slender, and always has something of a synovial bursa about it, sometimes entirely surrounding it, so that the ligament is not attached to the capsule.

The biceps tendon is not only inserted into the fibula and

tibia, but its tendon blends with the posterior and outer part of the capsule from the origin of the outer head of the gastrocnemius down. It can be separated from this part of the capsule only by a forced dissection, and cannot fail to take some of the side strain of the joint in extension.

Under these two lies the capsular thickening called the short external lateral ligament, which is less sharply defined than the internal lateral. These fibres also radiate from a prominence on the external condyle, and pass down to the tibia and fibula; but the shortest fibres are on the average one centimetre longer than on the inner side of the joint, thereby allowing more movement of one bone on the other than can take place at the inner side.

The function of the external lateral ligament and its assisting structures is to resist strains tending to bend the knee outward, and in other respects to act with the internal lateral in limiting external rotation of the leg, and carrying a share of the weight when the foot is lifted from the ground.

The posterior part of the capsule consists of two hoods which cover the two femoral condyles between the lateral ligaments and the crucials. At the popliteal notch they blend with the posterior crucial ligament. On the tibia they are attached just below the margins of the articular surface, except as the external continues on the posterior surface of the popliteus with the expansion of the semimembranosus, and on the femur they are attached very near the edges of the articular cartilage.

Superficial to this, but under the gastrocnemius, lie some oblique fibres of irregular arrangement and size which are grouped as the "posterior ligament of Winslow." In a general way they run as slender fibrous bands from the place where the semimembranosus tendon reaches the capsule to the upper and outer side of the popliteal notch. One or two strong bands usually arise from the semimembranosus tendon itself, but most of these strands have no connection with it, and seem better adapted for furnishing an elastic bed for the popliteal artery and preventing its kinking in flexion than for strengthening the articulation. The experiments of Poirier<sup>1</sup> point

to the same conclusion. In two joints out of sixteen, some of the strands were so directed that they could possibly draw both semilunars backward as the semimembranosus contracted, but other dissections indicated that this was an exceptional arrangement.

In full extension the attachments of these posterior hoods to the tibia and femur are separated about five centimetres, while in flexion the distance is reduced to a single centimetre. This slack of the capsule in flexion is taken up by the two heads of the gastrocnemius which not only cover the two hoods behind, but take origin from them for a distance of about two centimetres.

The patella has a thick layer of cartilage on its posterior surface, even thicker than the layer to be found on the trochlear surface of the femur. This surface is convex in all diameters, most convex from side to side.

With complete contraction of the quadriceps, the whole of the articular surface of the patella is raised above the articular surface of the femur. With knee extended and quadriceps relaxed, the lower half or third of the patellar cartilage is in contact with that of the femur.

During flexion the patella slides down, having more contact with the external than with the internal condyle. With the knee bent to a right angle or completely flexed, its contact is very slight with the internal condyle, being one centimetre or less in width. Even this contact can be lost, and the inner border of the patella may slip in between the condyles.

In a kneeling position with the joint bent to a right angle most of the weight of the body is carried on the patella. When the joint is completely flexed, the body weight is carried on the tubercle of the tibia.

The bursæ in front of the patella and that beneath the patella tendon have always been found when sought, and the latter, though separated from the synovial cavity of the joint by a thin partition, has never been found to communicate with the joint.

English and American text-books of anatomy are curi-

ously silent as to the lateral ligaments of the patella, and the latest German book does not even mention them. One or both existed in each of twelve joints dissected carefully, and the internal was identified in fifteen other joints taken at random.

The internal is much the stronger, and is a flat, triangular band passing from the prominence on the internal femoral condyle to the upper half or two-thirds of the inner border of the patella. It is a distinct band at its origin, has many almost horizontal fibres of the vastus internus inserted into its anterior surface, and finally, covered by the muscle, mingles with the complex fibres of the quadriceps aponeurosis surrounding the patella.

The external is thinner, narrower, and weaker, and was not found in two joints out of twelve as a distinct structure, though even in these there were a few slender transverse fibres. When present it passes horizontally forward from the prominence on the external femoral condyle to the upper third of the external border of the patella. It is interlaced with fibres of the iliotibial band and with the extensor aponeurosis near the patella.

The function of these ligaments is to steady the patella as it slides on the femur, and prevent lateral slipping or dislocation, and, as the strain is greater on the internal than on the external, the internal is not only much stronger, but it is reinforced by the lower vastus internus fibres which are inserted on its anterior surface.

The ligamentum mucosum is a thin, vertical partition of synovial membrane between the two sides of the joint. It has a free upper border which extends from just below the patella to the anterior crucial ligament. In a total of fifty-eight cases where it was noted, it was apparently lacking in two, and in two other cases the ligament had evidently been torn. It was a mere thread in eight cases, a band with an opening below it in four cases, and in nine cases it was a complete ligament.

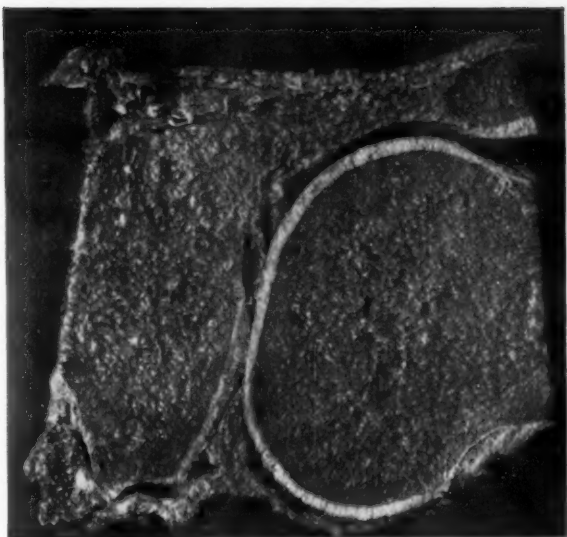
The mucosum may be a vestigial structure, but is of present use in holding the anterior synovial pad against the femur.

PLATE XI.



Sagittal section through internal condyle and tibia, left knee, outer side of section, joint extended.

PLATE XII.



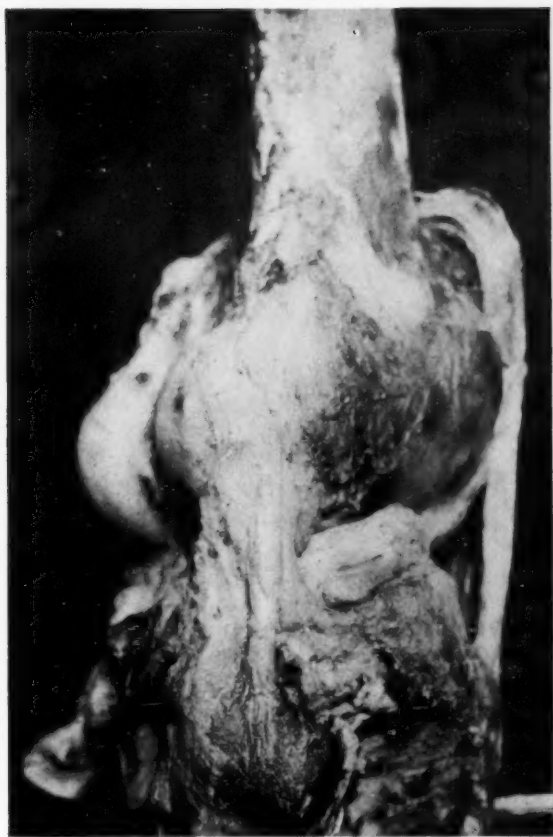
Sagittal section through external condyle and tibia, left knee, inner side of section, joint extended.

PLATE XIII.



Right knee, internal lateral ligament.

PLATE XIV.



Right knee, external lateral ligament.

PLATE XV.



Internal patellar ligament and synovial pouch on front of extended joint, right knee. Joint cavity distended with wax. Upper and lower margins of patella marked by black lines.



There is some confusion in the literature as to the structures to which the name "alar ligaments" belongs. An instance of this is found in Allingham's<sup>4</sup> monograph, where he quotes Lang's description of the alar ligaments as "fringes of the ligamentum mucosum;" . . . "in many cases hard and cartilaginous; . . . always found to be introduced between the femoral condyle and the anterior portion of the semilunar fibrocartilages in complete extension." This description evidently applies to the postero-inferior free margin of the infrapatellar pad.

When the joint is opened by a transverse cut above the patella and this bone is turned down, two tense folds of synovial membrane can be seen passing forward from the ligamentum mucosum to the sides of the patella. These answer to the description of alar ligaments given by Morris and others, but do not appear on the interiors of joints hardened in formalin, from which the femurs have been subsequently removed. Their apparent continuation as two fibrous folds of the extensor aponeurosis on either side of the patella projecting backward into the joint can always be seen, though the external is much less prominent than the internal. The writer believes with Pauzat<sup>3</sup> that the synovial folds appear only in certain positions which do not exist in life. Pauzat has traced distinct bundles from the fibrous folds above described to the anterior ends of the semilunar fibrocartilages, and believes that they serve to pull the semilunars forward and up with the contraction of the quadriceps. The writer has not traced such bundles, but has found these folds spreading out generally into the fibrous framework of the infrapatellar pad, and believes that their function is to pull this pad forward and up out of harm's way during extension.

Within the joint there are several pads covered with synovial membrane, which are composed of fat, fibrous tissue in varying amounts, and blood-vessels. The largest of these pads is attached to the extensor tendon below the patella and is rather triangular on section. The broad base is in contact with the femur, and the two free extremities of the base

project upward between the patella and femur, and backward between femur and tibia. The lateral boundaries of this pad are usually well defined, being opposite the margins of the femoral condyles. It is held in contact with the condyles by the tension of the ligamentum patellæ and the mucosum.

The pad shows a tendency to become lobulated, and the lobules to develop pedicles. These lobules are of two kinds, —one composed of fat covered with synovial membrane, soft, and often ending in fine fringes as if it had been caught and frayed between the adjacent bones, the other composed of tough, fibrous tissue, pediculated, and never frayed or fringed.

Besides this largest fatty and synovial pad, there is a smaller one loosely attached just above the articular surface on the front of the femur, which is in contact with the patellar articular surface in extension. This shows smaller lobules which are often fringed. Two other small pads are found posteriorly in the joint just above the attachment of the two semilunars to the posterior part of the capsule. In two cases fibrous strands from these were found over the external semilunar cartilage, but none were found over the internal. These are the only pads which are constant, but often small ones were found on the front and outer side of the anterior crucial ligament, and projecting from the synovial membrane on the sides just above the attachment of the semilunars to the capsule.

One function of these pads seems to be that of "wipers," which keep the synovial fluid spread evenly over the patellar cartilage and the condyles of the femur. They also increase the area of synovial membrane which secretes this fluid, and possibly this is their chief function.

The synovial cavity of the knee-joint is very extensive, the synovial surface being much greater than that of any other joint in the human body. The capacity of this joint is nevertheless not large, but varies according to the presence or absence of accessory cavities communicating with the joint.

In testing the capacity of the knee, a series of fourteen undissected joints was taken, all about the average size and

adults. From a graduated reservoir two metres above the subject, a column of water was used to produce a pressure approximately that in the human arteries. The results varied as follows:

	Right. Cubic Centimetres.	Left. Cubic Centimetres.	
1. Female . . . . .	80	90	No bursæ.
2. Male . . . . .	200	180	Large bursæ about semimembranosus and biceps tendons.
3. Male . . . . .	120	170	Small bursæ about semimembranosus tendons.
4. Female . . . . .	90	80	No bursæ.
5. Female . . . . .	120	84	Rheumatoid. Left anterior crucial ruptured. Free bodies. Bursa around right external lateral ligament communicates with biceps bursa and joint cavity.
6. Male . . . . .	100	90	No bursæ.
7. Male . . . . .	180	200	Large bursæ about biceps and semimembranosus.

With extended joint, this fluid was almost all anterior to the lateral ligament and under the quadriceps expansion. With joint flexed the fluid was forced to the back of the joint. After all the fluid had entered an extended joint that would, some thirty centimetres more would flow in if the joint were slightly flexed, and after this some little force was required to hold the knee in extension again. The patella could always be made to "float" after the admission of thirty cubic centimetres of fluid. Lübke,<sup>5</sup> Picqué,<sup>6</sup> Meisenbach,<sup>7</sup> and O'Connor<sup>8</sup> report cases of hæmarthrosis from which blood has been aspirated in amounts varying from 130 to 180 cubic centimetres.

In no case has a large cavity been found under the quadriceps, the bursa extending upward less than seven centimetres, and communicating with the rest of the joint in every case which can be recalled. No notes were made on this. Higgins<sup>2</sup> reports that 98 per cent. of cases show such communication.

In extension there is a synovial cul-de-sac above and on either side of the patella where synovial membrane is in contact with synovial membrane. This disappears during flexion.

The anterior wall of the sac is intimately connected with the extensor aponeurosis, and the posterior wall lies loosely against the non-articular front of the lower end of the femur internal and external to the patella. It extends about five centimetres above the level of the upper border of the patella, and usually communicates freely with the bursa under the quadriceps expansion. Laterally, it slopes down to pass under the lateral ligaments of the joint.

*Summary of Movements.*—The fully extended joint is without lateral motion, anteroposterior motion, or rotation. All three movements are present to some degree after slight flexion and increase up to right-angled flexion, after which they diminish again.

Extension is limited first by the posterior crucial. After rupture or section of this ligament, extension is still further increased by rupture or section of the anterior crucial, and later after rupture of the internal lateral and external lateral ligaments.

The oblique or posterior ligament of Winslow resists this motion little, if any. Flexion is limited by contact of the soft parts.

External rotation is limited by the two lateral ligaments and increased after section or rupture of either.

Internal rotation is limited by the internal lateral and anterior crucial in combination, and increased after section or rupture of either.

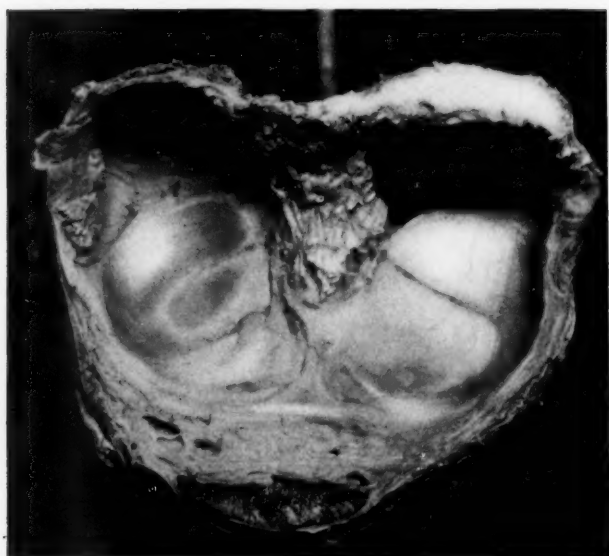
A slight forward slipping of the tibia on the femur is possible in external rotation, but is stopped first by the anterior crucial, and later by the two lateral ligaments. A slight backward slipping of the tibia on the femur is also possible on external rotation, but is limited first by the posterior crucial and later by the two lateral ligaments. Adduction and abduction are also possible in external rotation to a degree which can be felt with the hand on the joint. Adduction is limited first by the external lateral ligament, and later by the posterior crucial. It is also increased on the cadaver after removal of the internal semilunar. Abduction is limited first by the in-

PLATE XVI.



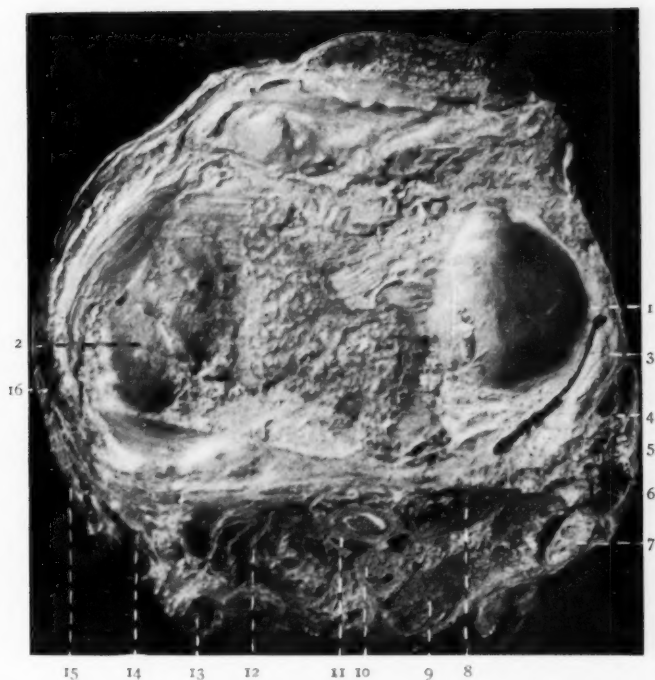
External patellar ligament and synovial pouch. Same joint as Plate XVI.

PLATE XVII.



Right knee, specimen hardened in formalin. Femur removed, showing two posterior hoods of the capsule.

# PLATE XVIII.



Horizontal section through right knee, joint hardened in formalin. Section passes through middle of internal semilunar cartilage and just above middle of the external.

- |  |   |
|--|---|
| 1. External semilunar.                                   | 9 and 12. Gastrocnemius.                              |
| 2. Internal semilunar.                                   | 10. Internal popliteal nerve.                         |
| 3. Slit between popliteus tendon and external semilunar. | 11. Popliteal artery with veins between it and nerve. |
| 4 and 5. External lateral ligaments.                     | 13. Tendon of semitendinosus.                         |
| 6. Biceps tendon.  | 14. Tendon of semimembranosus.                        |
| 7. External popliteal nerve.                             | 15. Tendon of sartorius.                              |
| 8. Plantaris.  | 16. Internal lateral ligament.                        |

PLATE XIX.



Infrapatellar pad showing tabs, left knee.



ternal lateral, and later by the posterior crucial. On the cadaver abduction is greater after removal of the external semilunar.

#### SURGERY.

Among these 150 cadaveric joints were found examples of nearly every "internal derangement of the knee-joint" which has yet been described, as well as two which may be properly included under the same head, and which have not been described in print heretofore, so far as known.

A classification of internal derangements according to their frequency in my series of joints would be

1. Tabs from the lubricating apparatus.
2. Erosion of cartilage.
3. Damaged and displaced semilunar cartilages.
4. Ruptured ligaments.
5. Free and loose bodies.

6. Villous or papillary synovitis, of which no instance appeared in these joints, and which will not be discussed. Hoffa<sup>9</sup> describes another condition as "atrophy of the quadriceps," which allows the capsule to catch between patella and femur or femur and tibia. He describes it from the double stand-point of surgeon and patient, and says that the condition usually dates back to some injury which requires rest in bed for a few days. It is curable by massage and gymnastics. My studies of cadaveric knees make me doubtful of the possibility of catching any portion of the normal synovial membrane except the tabs from the lubricating apparatus.

#### I. TABS FROM THE LUBRICATING APPARATUS.—PLATE XIX.

The most frequently injured structure among my joints was the infrapatellar pad. Its condition was noted in 100 joints, and in every case there was some evidence of damage, unless the fine fringes on the edges of the soft fatty pads may be said to be normal constituents of the adult joint. These fringes were constant both for the part of the pad next to the femoropatellar contact and that nearest the femoro-tibial contact. During flexion the edge of the pad nearest

the femoropatellar contact may be caught, and during extension the edge nearest the tibia. The suprapatellar pad often showed something of the same condition caused by its catching between the patella and femur during flexion, but here the apparent damage was less than below.

In either location a slight dryness of the joint will permit of a catch and pull, if not an additional crush of a tab.

No other joint in the body presents so favorable an arrangement for internal injuries, which, though slight and comparatively painless, may open both the lymphatic and general circulation into its cavity, and no other is so often attacked in the course of a general infection.

In one joint with marked loss of articular cartilage, where there was actual bony contact between patella and femur, with grooves and ridges worn in both, there were no fatty or fibrous tabs. Both pads were shrunk, and the fat was so largely absorbed, that the fibrous framework which is usually scarcely to be seen on the surface was more apparent than the fat.

Whether a loss of synovial secretion from an atrophied pad increased the friction between patella and femur and caused a wearing away of the articular cartilage is not known. The condition was interesting and unique in this series.

In twenty-two joints out of 100 noted there were seen tough fibrous tabs, pediculated and attached to the infrapatellar pad. These were situated as follows:

Internal to mucosum only in .....	18 joints.
External to mucosum only in .....	2 joints.
Both internal and external .....	2 joints.

These tabs were without fringes and were never found crushed, but in three joints were found injuries on the anterior part of the external semilunars which could be accounted for by a crushing force exerted through this tab in extension. These were the only semilunars seen with this injury.

There are but few references in the recent literature to operations for the removal of fatty and fibrous tabs as such. Some reported as growths from the synovial membrane above

the patella were possibly tabs from the suprapatellar pad. Others described as fringes of the ligamenta alaria are evidently tabs from the infrapatellar pad.

Goldthwait<sup>10</sup> removed tabs and fibrin masses from nineteen out of thirty-eight knee-joints opened. Allingham<sup>4</sup> removed them in two cases out of fifty-nine joints opened, and Turner<sup>11</sup> in three cases out of twenty-nine.

From my study of the cadaveric knees, it seems as if a much larger number of individuals must suffer from the conditions which appeared in connection with the supra- and infrapatellar pads than Allingham and Turner's figures indicate.

Where these form a mechanical obstacle to the perfect working of the joint, they can only be removed by mechanical means. The only treatment is operation.

## 2. EROSION OF ARTICULAR CARTILAGE.—PLATES XX, XXI.

A frequent injury found in these joints was seen on the articular cartilage at the back of the upper surface of the external tibial tuberosity. The damaged area usually measured a little over a centimetre in diameter, and was always rounded. It was noted as follows:

Normal tibial surfaces .....	59
Softened tibial surfaces .....	19
Old fibrous surfaces .....	43
Not noted .....	29
	<hr/>
	150

It showed all stages from a shallow cracking or "crazing" of the smooth cartilaginous surface to bare bone with a few tufts of fibrous tissue projecting from the edges and from small centres inside the bare space. Five joints in which the "lipping" of bone was well marked showed normal cartilaginous surfaces at this point. There was no constant relation between this condition and gross injury to the semi-lunar.

Dorsal decubitus with antemortem or postmortem maceration might be suggested as a cause for this condition, but

one-third of all these joints showed tough fibrous tissue in place of the articular cartilage which would indicate antemortem change. Moreover, if it result from maceration, the damage should be as evident in the synovial pouch under the popliteus, which is lower than this tibial area in the dorsal position. This was not found to be the case. The appearance of these areas suggests mechanical damage rather than maceration.

If an individual is kneeling for any considerable time, the fluid contents of the joint must gravitate towards the patella, leaving the back part of the joint comparatively dry, and most individuals when working on their knees do so with internal rotation of the leg, which brings this part of the tibial surface in contact with the back of the external condyle of the femur.

The first movement, on rising to the standing position, is to draw one foot forward and plant it on the floor, putting this knee in nearly complete flexion. Then extension begins with the entire body weight resting on this knee. This gives us motion with a maximum of pressure and a minimum of lubrication as a possible cause for the damage seen.

If this condition exists as often among those whose work is done while kneeling as in this series, it perfectly accounts for the stiffness and difficulty with which they rise to their feet, and the absence of stiffness and pain when they are erect and walking about.

Another pathological condition was a loss of cartilage along the inner border of the patella. Where the cartilage appeared normal, there was often a fraying out of the edge of the internal alar ligament, or of the loose tissue lying partly covered by the alar and between it and the inner edge of the patella.

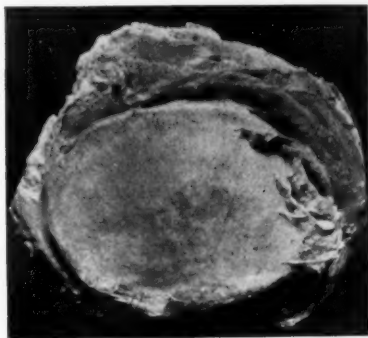
In right-angled flexion the main contact of the patella is with the external condyle, there being normally about one centimetre of its width in contact with the internal. With a lateral movement while kneeling, the inner edge of the patella might be forced into the popliteal notch, provided the internal

PLATE XX.



Articular surface right tibia, showing erosions at back part of external tuberosity.

PLATE XXI.



Left patella, showing damage to articular cartilage at inner margin.

PLATE XXII.



Three right internal semilunar cartilages, showing fracture opposite internal lateral ligament upper surface.

PLATE XXIII.



Same as Plate XXII, under surface.

PLATE XXIV.



Semilunars of right knee, showing effects of long-continued friction.



Transverse fracture at attachment of internal lateral ligament .....	2
Transverse fracture with splitting or tearing from capsule .....	1
Transverse fracture with wear on under surface only..	5
Wear on under surface without complete fracture....	4
Split or torn from capsule .....	2

---

 14 = 42

Grouping all the damaged internal semilunars together there were:

Showing decided injury .....	24
Showing only fringes along the edges .....	5

---

 29

The same grouping of the damaged external semilunars gives:

Showing decided injury .....	18
Showing only fringes along the edges .....	10

---

 28

Of these forty-two joints, twenty-four were noted as showing some of the marks of inflammation or degeneration of articular cartilage, and doubtless more would have shown under a microscope the earlier changes which are associated with this condition. The important thing, so far as the semilunar cartilages are concerned, is the dryness and consequent friction which is almost always present in some stage of the condition.

The first noticeable effect of friction may be expected to show in the appearance of fine fringes or strands at the edges of the semilunars after the cartilage layer is worn away. Or, one or both of the semilunars may be caught between the moving femur and tibia and split longitudinally somewhere between their free edge and their capsular attachment as described by Barker <sup>12</sup> and others. If both remain attached to the capsule, they may be worn down to the fibrous core, which itself may be torn and irregular as shown in Plate XXIV.



These injuries may all take place as a result of friction while the ligaments retain their normal adjustment, but long-continued friction must ultimately result in ligamentous damage through the strains produced by catching the semilunars and wedging the bones apart.

In many of these joints it has been impossible to decide whether the dryness and friction preceded or followed the ligamentous injury. Injuries to the knee which are classed as acute synovitis or sprain, and are not seriously disabling at the time, occur frequently among young patients, who are less likely than the subjects from which these joints were taken to show degenerative changes. So it has seemed worth while to study the results of extreme movements on the ligaments, and the relation of ligamentous damage to the more obvious injuries seen on the semilunars.

Experimental work on the cadaver cannot reproduce the conditions during life, but some of the results are worth considering. First, do the ligaments of the knee tear off their bony attachments, or do they rupture in their continuity?

The results obtained by Segond,<sup>13</sup> Poirier,<sup>1</sup> Bonnet,<sup>14</sup> Pagenstecher,<sup>15</sup> Hoenigschmied,<sup>16</sup> Jersey,<sup>17</sup> and myself indicate that on the cadaver ligaments almost invariably tear from their bony attachments (usually from the femur), and usually with fragments of bone attached. Larsen<sup>18</sup> reports an operation for a loose osseous body in the knee attached to the femoral end of the anterior crucial ligament. Swan<sup>19</sup> and Fürbeck<sup>20</sup> both report similar operative cases. Pagenstecher reports three operative cases with rupture of the femoral attachment of the crucial ligaments, and Battle<sup>21</sup> and Robson,<sup>22</sup> one case each. So far as cadaveric experiment and the reported operative cases go, it seems most likely that the crucial ligaments at least, and probably the laterals as well, are torn from their bony attachments more often than in their course.

Hints<sup>23</sup> is evidently of the contrary opinion, but presents neither experiment nor operative case to confirm his opinion, and quotes one description of Dittel's which directly states the existence of such an injury.

### Second, What ligaments rupture?

Hints has gathered reports of thirty-four cases of rupture of the lateral ligaments of the knee with and without other ruptured ligaments. None of these cases were complicated by dislocation of the bones. Thirty-one of these were cases of rupture of the internal lateral and three of the external.

The experiments of Segond on the cadaver show that abduction alone or abduction combined with either rotation will rupture the internal lateral ligament by itself, also that adduction alone or combined with either rotation will rupture the external. With rotation alone, he always fractured the bones below the knee before any damage was done to the ligaments, and he quotes Bonnet as having had the same experience.

As to hyperextension, the results of his experiments agree with those of Poirier, who found the internal lateral remaining intact until after rupture of both crucials. Hoenigschmied was able to rupture the internal lateral ligament by external rotation, and the anterior crucial and internal lateral by internal rotation, without producing bony fracture.

Pagenstecher was able to tear the anterior crucial ligament from the femur by strongly flexing cadaveric knees over a round stick in the popliteal space, and also by combining complete flexion with adduction and internal rotation.

The cases of ruptured crucial ligaments in the living reported by him and by Battle and Robson will be referred to later.

Practically, all of these observers agree in giving the immediate results of these ligamentous ruptures as we should expect, and they may be tabulated roughly as follows:

Ruptured.	Increased Movement.
Internal lateral.	Abduction and both rotations.
External lateral.	Adduction and external rotation.
Anterior crucial.	Internal rotation and forward slip of tibia on femur.
Posterior crucial.	Internal rotation, extension, and backward slip of tibia on femur.

The effects of these increased movements on the semilunar cartilages do not seem to have been studied except as the semilunars were damaged at the time of injury.

So long as the normal knee is kept in a position of internal rotation, the articular surfaces of femur and tibia are in such close contact that it is impossible to catch the semilunar fibrocartilages between the two articular surfaces. With external rotation and a dry joint it is possible to catch the internal semilunar if the joint be moved slowly, but it will not hold unless the internal lateral ligament gives way.

In twenty-four undissected joints one was found in which the internal semilunar caught and held under this manipulation. This joint had a noticeable increase of lateral movement, though no recent injury showed on dissection. In the other twenty-three joints the internal semilunars caught after section of the internal lateral ligament, at its femoral attachment, sufficient to allow an equal increase of lateral motion, which means, of course, an increase in external rotation.

If the femur be free to roll up on the posterior part of the internal semilunar, it may simply hold it for a moment and then squeeze it back as one "snaps" an apple seed. This may not damage the cartilage for some time, but when the ligaments have become stretched by repeated pulls or by some new and greater violence, the condyle can roll entirely over the semilunar and settle down behind it.

The joint is now locked in flexion, and must be unlocked by abduction combined with internal rotation and extension. Apparently the most common result of this anterior dislocation of the internal cartilage is that the posterior portion is pushed forward until stopped by its firm attachment to the internal lateral ligament, and opposite this attachment a bend or transverse fracture of the semilunar occurs. With repetition the cartilage layer underneath the semilunar is cracked off or worn through, and fibrous tabs appear at the point of fracture which may project over the uncovered tibial surface.

This has been the most common injury to the internal semilunars seen in these joints, appearing in twelve of the

fourteen where the internal only was damaged, and to a less degree in four of the fifteen joints in which both showed injury. Plates XXII and XXIII show three internal semilunars with this injury.

One joint shown on Plate XXV shows another possible result of over-riding. In this joint the internal semilunar has been torn from its capsular attachments all the way around and turned wrong side up into the intercondylar space, where it lies against the crucial ligaments with no tendency to return to its natural position. Croft,<sup>24</sup> Barker,<sup>12</sup> and Logan-Turner<sup>25</sup> have found this condition in the living.

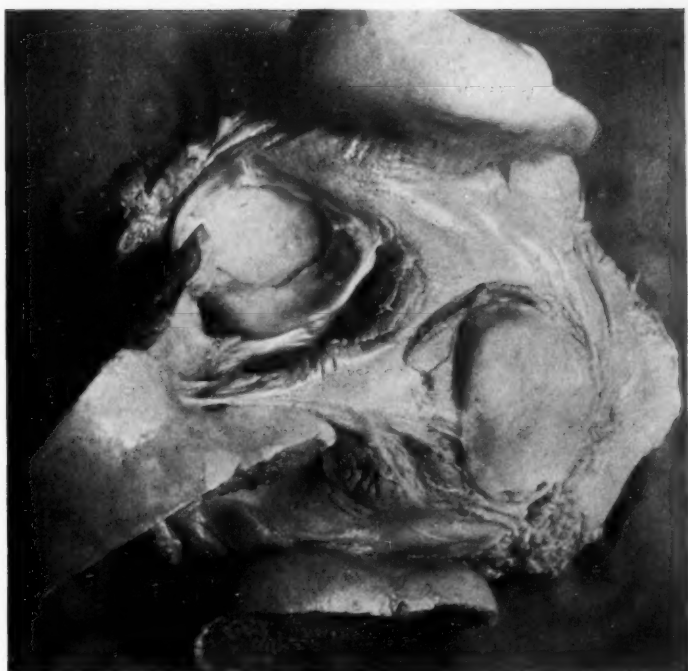
Several examples of another condition appear in the literature, though it is not the most frequent injury, as stated by Hoffa.<sup>9</sup> The internal semilunar is torn from its anterior tibial attachment and the free end may or may not be turned up or folded back on itself. As a possible way in which it is produced, external rotation of the leg while the knee is flexed to a little less than a right angle and is bearing a heavy weight seems to me the most reasonable. At the same time, the internal lateral ligament must be partially torn from its tibial attachment to allow of any tension on the anterior attachment of the semilunar. No instance of this injury appears in my collection.

For the femur to over-ride the external semilunar cartilage greater looseness of ligaments is necessary, because, unlike the internal, the external semilunar has much freedom of movement and has the shape of a blunt wedge on cross-section. Considering a tear from the capsular attachment as evidence, there are three joints in which anterior dislocation of the external semilunar may have occurred.

#### 4. RUPTURED LIGAMENTS.

"Sprains" and "acute traumatic synovitis of the knee due to strain" are scarcely to be found in recent literature outside the text-books. Ruptured ligaments, as such, appear but rarely, while dislocations are reported with some frequency, and the subject of "hæmarthrosis" of the knee-joint

PLATE XXV.



Complete dislocation of internal semilunar fibrocartilage, right knee. Both condyles sawn through vertically, and peripheral pieces turned out.

PLATE XXVI.



Left knee, showing results of rupture of anterior crucial ligament, and fringing of the upper portion of the infrapatellar pad.

has quite an extensive literature. Yet all of these are diagnostic names which cover varying degrees of ligamentous injury.

Hints's<sup>23</sup> collection of ruptured lateral ligaments has been referred to. Pagenstecher<sup>15</sup> has recently reported three cases of suture of the crucial ligaments in which the joint was opened three months, four days, and four months after the injury. In the first case, the posterior crucial ligament was found torn from the femur, and was sewn to the near-by periosteum with good result.

The second case showed an anterior crucial torn from the femur, which was also sutured with good result.

In the third case the anterior crucial was torn "near its insertion, atrophied," and was removed. Later, a free body was removed from this joint, and it became stiff as a result of some rheumatoid process. Robson<sup>22</sup> sutured both crucials to the femur eight months after injury with good result. Plate XXVI shows a joint with a complete rupture of the anterior crucial ligament.

Anterior dislocation of the external semilunar will not be so likely to result in damage to the cartilage itself as the same dislocation of the internal, because there is no fixed point behind which it will bend or break; but the "snap" with which the dislocation is reduced will be sharper than that on the inner side, owing to the different shape of the two semilunars on cross-section as shown on Plates XI and XII.

An extreme form of this injury appears in a museum specimen described by Godlee,<sup>26</sup> and has once been found at operation by Logan-Turner.<sup>25</sup> It corresponds to the dislocation of the internal cartilage shown in Plate XXV.

To allow anterior dislocation of the external semilunar, both the anterior crucial and the external lateral ligaments must be looser than normal. These two may be ruptured by extreme internal rotation combined with adduction, according to Segond.

If the femoral condyle overrides and settles down behind



its semilunar, and extension occurs while the joint is loaded heavily enough, the cartilage may be torn from its peripheral attachment and folded over into the notch. Otherwise, the dislocation will be reduced with the "snap," which accounts for the name "jerking" or "trigger" knee.<sup>27</sup>

It is possible that looseness of the external lateral ligaments may permit of sufficient external rotation to allow of a backward dislocation of the anterior portion of the external semilunar during extension, but no evidence of such a condition was recognized in these joints, and no such joint is described in the recent literature.

The only injury found exclusively on the external semilunar cartilages was a transverse tear at the junction of the anterior and middle thirds. This was seen in three joints of the four in which the tough fibrous tabs were found external to the ligamentum mucosum. It is possible that these tears may have resulted from the inclusion of such a mass within the well-fitting semilunar ring during extension, or when landing on the feet after a fall from some height. This connection was not noticed until the notes were tabulated and the joints thrown aside.

One hundred and twenty-eight operations on the semilunar fibrocartilages have been gathered from the reports of forty-seven different operators.

The pathological descriptions are so unlike that an accurate grouping of the conditions is almost impossible. The following is presented as approximately correct:

	Internal.	External.
Torn from or near anterior attachment ....	23	3
Transverse tear at or near lateral ligament..	38	..
Longitudinal split, incomplete .....	16	1
Longitudinal split, complete .....	8	..
Turned into intercondylar notch .....	3	1
Loose and sewn to tibia .....	23	3
Cystic .....	1	1
Ossified .....	..	1
Doubtful .....	1	5
	<hr/> 113	<hr/> 15



The "loose cartilage" is the most difficult to understand, for the anterior portions of both semilunars are normally loose in certain positions of the joint, and an increase in this would seem to involve a tear. Possibly such a tear might show on the under side of the semilunar, as in the cases seen by Barker<sup>12</sup> and in certain of my specimens.

Schaeffer<sup>28</sup> and others have treated mechanically disabled knees with an apparatus which permitted flexion while preventing external rotation and limiting extension and lateral mobility. If the disability be in the early stage before damage to the semilunar has occurred, this treatment has much in its favor; but if the semilunar has been fractured or torn off its anterior insertion, it is not easy to see how any apparatus can bring about a permanent cure even in function.

The exact diagnosis of semilunar injuries is as yet seldom attempted before opening the joint, and has often been uncertain even then. There is hope that by a careful study of the exaggerated movements, we may learn to locate the damaged ligaments, and thereby to reason out the semilunar injury resulting.

Suture of damaged cartilages has often been attempted, but it is worth attention that in later operations by the same men the damaged portions were removed. The opinion that removal is preferable to suture is now practically unanimous.

Thirteen days after injury, Battle<sup>21</sup> sutured both crucials to the femur and the internal lateral at some point, with good result. Two joints in my collection showed the results of rupture of the anterior crucial ligament.

On the other hand, cases of dislocation like Bergman's,<sup>29</sup> where the internal lateral and both crucials must have torn, and like Eames's,<sup>30</sup> five miners with the same injury, show that there are two sides to the question of repair. These six were all treated without opening the joint, and all recovered with useful knees.

Ligamentous damage of any degree must be followed by swelling. With a certain grade of injury the swelling

takes the form of an effusion within the joint. The more slowly the joint fills, the smaller will be the proportion of blood in the fluid. Pure blood has been aspirated from joints which filled within an hour after injury.

Lübbe<sup>5</sup> concludes, from a case reported by Kocher and one of his own, that blood may remain fluid in a knee for twenty-one days, or it may show clots after one day. He thinks the rapidity of clotting is directly proportional to the area of injured synovial membrane. He quotes Volkman as finding large masses of blood-clot as well as strong adhesions fourteen weeks after a contusion, while Delbastaille found that fluid blood in a very slightly injured knee was absorbed, except some pigment, within twenty-eight days. He believes that the rapidity of absorption is in inverse proportion to the synovial injury.

Three methods of treatment for these acutely distended joints are in use:

1. Rest followed by massage and movements. Lübbe<sup>5</sup> reports an average hospital stay of 34.6 days for twenty-two patients at the Seaman's Hospital in Hamburg, and thirty-eight days at a Copenhagen Hospital under this treatment.

2. Aspiration, repeated, if necessary, to relieve the distention and remove a material which would discourage movement and encourage the formation of adhesions.

From the Hamburg Hospital, Lübbe<sup>5</sup> reports an average stay of 25.5 days for thirty-two patients aspirated, and 22.4 days for the aspirated cases under Bondeson at Copenhagen. The great majority of writers<sup>31</sup> on this part of the subject favor aspiration, regarding it as safe if carried out with the most perfect asepsis, as shortening the time for recovery, and as giving better functional results.

3. Incision with drainage. O'Connor<sup>32</sup> is the most vigorous advocate of this procedure, and his conclusions after twenty-two successful consecutive arthrotomies are worth repeating.

"The question of draining gonorrhœal joints is settled."

"Washing out blood-clots from an injured joint is a surgical obligation." "Traumatic 'water on the knee' is best treated by arthrotomy and drainage."

He irrigates all his open joints with 1 to 1000 sublimate solution, and drains them until nothing but normal synovial fluid comes from the wound.

Whichever of these three methods be employed, the great probability of ligamentous injury ought to be kept in mind, an accurate diagnosis of the location and extent of the damage should be sought for by testing the joint for exaggerated movements, and the treatment should be directed not only towards an immediate recovery of function, but to the end that the ligaments may preserve the joint against further disability in connection with the semilunar fibrocartilages.

It may be that within a few years the early opening of these joints with immediate repair or removal of damaged structures will be the definite rule of procedure.

The writer believes that early or late repair of the internal lateral ligament, which is certainly the most accessible and probably the most frequently injured, will prevent some of the disability now caused by dislocation of its semilunar, and that in some cases it will be found to be a "surgical obligation."

##### 5. FREE AND LOOSE BODIES.

Among my specimens there were but two which showed free bodies in the joint. In both they were small and numerous, and in both there was decided "lipping" of the margins of articular cartilage. Berry<sup>33</sup> removed 1047 free bodies from a joint which four years earlier had furnished him fifty. These consisted of a nucleus of cartilage surrounded by fibrous tissue and varied in size from a fine bead to a pea.

Thompson<sup>34</sup> removed several hundred from another joint, of the same structure with scattered areas of calcification.

Bazy<sup>35</sup> argues from his study of a similar case that these multiple bodies are the result of a dry arthritis with overgrowth of the articular cartilage at the margins.

Fowler<sup>36</sup> regards these as arising from embryonic cartilage cells in the synovial membrane.

The bony and cartilaginous masses found by Fredet,<sup>37</sup> Jaboulay,<sup>38</sup> Codman,<sup>39</sup> and many others are apparently of a different origin, and represent pieces of articular cartilage knocked off by direct violence, or pulled off with some ligament with or without bone tissue.

While these may consist of one, two, or even more fragments, they are not multiple to the extent found with the other type, and of course do not reappear as do the others.

Operations for removal of these bodies was successfully performed previous to 1803, according to William Hey.

Woodward<sup>40</sup> says that in 1860 Larry collected 131 operations for simple removal of free bodies. Where attempt was made to remove the body by direct incision 74 per cent. were cured, 4 per cent. were unsuccessful, and 21 per cent. died. The subcutaneous operation in two stages gave 49 per cent. cured, 38 per cent. unsuccessful, and 13 per cent. of deaths. Woodward collected 104 cases up to 1889 with six poor results, two amputations of the thigh, and one death.

Marsh<sup>41</sup> found seventy-two cases between 1885 and 1895, with no deaths, and sixty-two perfect recoveries.

I have tabulated 297 cases, all reported since 1895, including all sorts of operations on non-purulent knee-joints, with six resulting in ankylosis, no amputations, and no deaths. Operative removal of these free bodies is the only treatment to be considered to-day.

#### INCISIONS.

The uncertainty of our present methods of disinfecting the skin makes it desirable to arrange that the skin sutures shall not follow the lines of the incision in the capsule. This is accomplished by making a U-shaped flap of skin and turning it up or down to expose as much of the deep fascia as is necessary.

Incision 1. Beginning at the inner border of the patella, a finger's-breadth below its upper border, the incision runs downward nearly to the tibia, and then backward above the

internal semilunar to the internal lateral ligament. It can be extended above at the expense of the internal lateral ligament of the patella and back into the lateral ligament of the joint if necessary. This will expose the anterior two-thirds of the internal condyle, the anterior half of the internal semilunar, the lower portion of the anterior crucial ligament, the mucosum, and the inner half of the infrapatellar pad in its natural relations.

Incision 2. This begins with extended knee at the upper end of the outer border of the patella, passes downward to the upper border of the external semilunar, then backward along this upper border to the external lateral ligament. If this incision be carried up a little through the extensor fibres, it will expose the suprapatellar synovial pad. Otherwise, it will expose the anterior two-thirds of the external condyle, the anterior half of the external semilunar, the mucosum, and the outer half of the infrapatellar synovial pad in its natural position. The patella can also be tipped up so that practically the whole of its posterior surface can be examined.

Incision 3. This is made along the anterior border of the biceps, with extended knee, down to the capsule. Flexing the knee allows the biceps to pull back out of the way and the iliotibial band to partially cover the field. This latter can be nicked and drawn out of the way. The capsule is now lax and can be opened either above or below the popliteus tendon. Below the tendon, the incision opens into the pocket under the popliteus, which in the ordinary bed position is the lowest portion of the joint cavity. Through Incisions 2 and 3 the whole or any portion of the external semilunar can be removed.

Incision 4. With extended knee this follows the anterior border of the sartorius down to the capsule. The muscle draws back as the joint is flexed, and the capsule may be opened behind the main part of the internal lateral ligament, either above or below the semilunar. Through Incisions 1 and 4 the whole or any part of the internal semilunar can be removed.

The two posterior incisions in the capsule are short and give a small field for operation, but are sufficient for the purposes above mentioned, and will allow gauze drainage from the dependent part of the cavity, provided the joint is allowed to rest partially flexed. Otherwise, the two posterior hoods are in close contact with the femoral condyles.

A possible form of drainage is continuous irrigation, in through one posterior incision and out through the other. The fluid in this case would wash practically every portion of the synovial membrane, except, perhaps, the bursa, under the quadriceps.

The joint has often been opened by one of three transverse incisions which pass either above, below, or through the patella. Niehans<sup>42</sup> has suggested a long vertical cut internal to the patella which turns out at a right angle below the tibial tubercle. The patellar tendon is then chiselled from the tibia and turned up with the patella and front of the capsule.

These extensive incisions are not necessary for complete examination of the joint. The large openings increase the possibility of infection from the air, the operator, or assistant's mouth, and other sources. They prolong the period of immobility, and without exception they give a distorted view of the relations of the fatty pads to the articular surfaces.

A transverse incision may be found necessary to complete the operation in some cases. Under these conditions, the writer believes that sawing of the patella just below its middle, or preferably the section of the patellar tendon immediately below the bone, avoiding injury to the infrapatellar pad, will give the maximum of working-room with the minimum of later inconvenience in the use of the joint.

The writer desires to acknowledge his indebtedness to Professor Thomas Dwight for opportunity and material, to Dr. Franklin Dexter for the encouragement which started the investigation, to Dr. Harold C. Ernest for the use of his photographic apparatus and laboratory, and to Dr. S. B. Wolbach for the skill and patience which show in the photographic work.



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**SOME REMARKS ON TUMORS OF THE CHIASM,  
WITH A PROPOSAL HOW TO REACH  
THE SAME BY OPERATION.<sup>1</sup>**

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I WISH to report briefly a case of tumor of the base of the brain which came to my observation recently, and will close my report by a few remarks on tumors of the chiasm in general, and a proposal of how to reach such tumors by operation.

The case in question is as follows:

G. L., aged sixteen years, was admitted to the German Hospital, December 9, 1903, and died December 12, 1903. The patient was first seen on March 10, 1903, by an ophthalmologist, Dr. Denig, to whom I am indebted for the following notes: The patient complains of poor vision for five months; since that time he has had from four to seven attacks daily of neuralgic headache. Got into the habit of shaking his head at times, and of holding it turned slightly to the right. When five years old he went through an alleged attack of meningitis.

Vision: Right, minus 0.5, minus cyl. 2.25, horiz. vision,  $\frac{1}{4}$ .

Left, minus 0.5, minus cyl. 1, horiz. vision,  $\frac{1}{4}$ .

Pupils normal; perimetrical examination shows bitemporal hemianopsia, and right optic nerve shows a varicose vein. Probable diagnosis: old meningitis, with hydrocephalus internus, or, more probably, tumor of the chiasm, possibly with varicosity. Optic normal. (I include drawings of the results of the perimetrical examination.) (Figs. 1 and 2.)

Dr. George W. Jacoby, to whom the case was sent, takes the matter for a residuum of the meningitis which the boy experienced

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<sup>1</sup> Read before the New York Surgical Society, February 24, 1904.

at the age of five. To exclude acromegaly, thyroid tablets are given. On the 28th of July, the vision on the right side  $\frac{1}{6}$ , left  $\frac{1}{4}$ , a perceptible diminution. Slight hyperæmia in the vessels of the fundus. On December 8, the same vision as at the last examination. No other changes, except an increase of headaches. Had another consultation with Dr. Jacoby. Drs. Jacoby and Denig concur in the diagnosis of tumor of the chiasm, and decide on an operation to relieve pressure, with a view to a trial to extirpate the tumor.

My examination of the patient on December 10 showed the following: Family history negative; the personal anamnesis being the same as above, except that projectile vomiting has to be mentioned, which occurred daily during the last six months. At present he has paroxysmal headaches every few minutes, which are, at the time of the intended examination, so strong that it has to be postponed; the patient being practically unconscious, or at best semi-unconscious. The hemianopsia is progressive, with marked primary atrophy of the hemianoptic fields, and slight hyperæmia. The knee-jerk and foot clonus are exaggerated, especially on the right side. No sensory disturbances. Slight optic atrophy, more marked in the right eye. Exophthalmus of right eye, pupils react equally to light; no oculomotor disturbances. Heart normal. Diagnosis: tumor of the hypophysis reaching to the anterior angle of the chiasm of the optic nerves, with pressure on the same. I may be permitted to state that bitemporal hemianopsia means blindness of both nasal halves of the retina.

After due consideration of the case and a consultation with the father of the patient about the chances of a removal of the tumor, this operation was decided upon.

The way to reach the chiasm in an operation is rather unexplored; and, while I have made a number of experiments to this purpose, some further operations on the cadaver were considered necessary, and the operation on the patient was therefore postponed a few days. During the night of December 11-12, that is two days after admission, the entire clinical aspect of the case changed suddenly. The temperature, which had been normal before, rose to  $104^{\circ}$  F., and the patient's condition became semicomatose. The right pupil was widely dilated, while the left presented the size of a pinhole. All four extremities were paralyzed to a certain extent. These symptoms indicated a perfora-

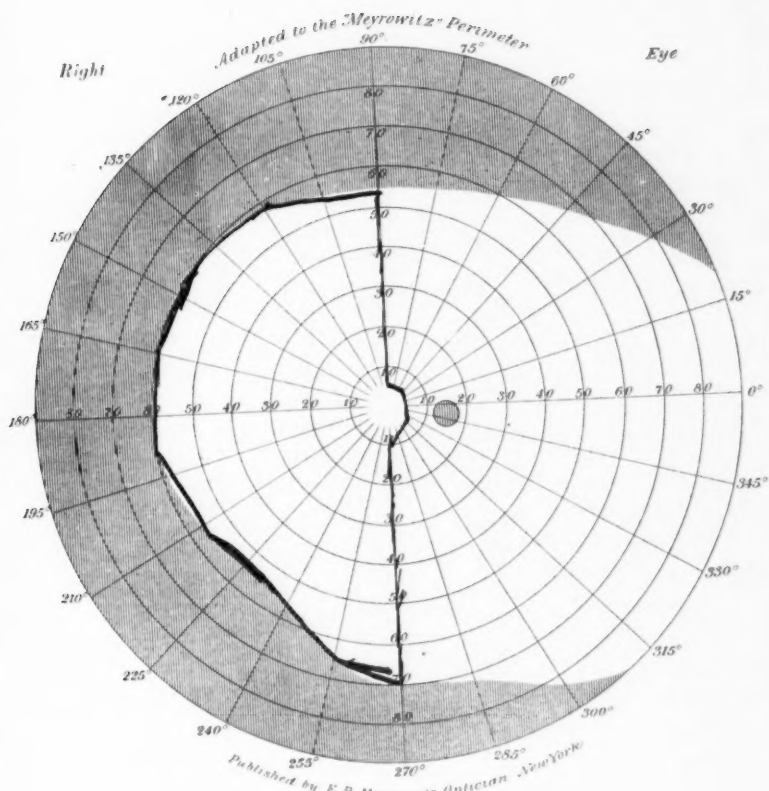


FIG. 1.—Perimetrical examination of right eye.

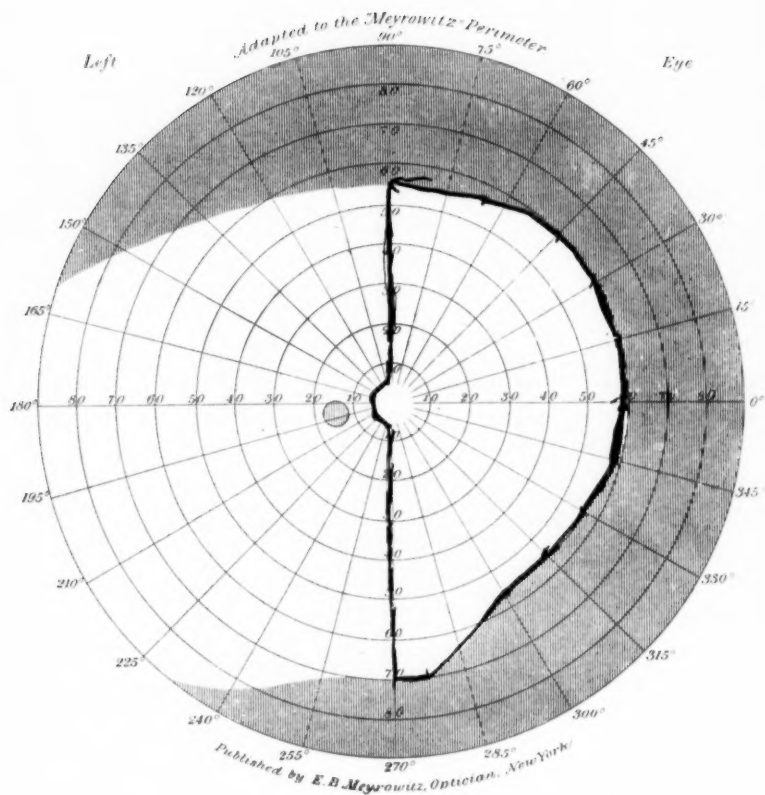


FIG. 2.—Perimetrical examination of left eye.

tion of the tumor, possibly cystic, into the lateral ventricle; eventually hæmorrhage into the same. For that reason an immediate operation was decided upon to relieve the pressure on the ventricle. The condition of the patient was so comatose that it was deemed possible to operate without narcosis; but shortly before the operation he revived so far that a slight chloroform anæsthesia became necessary.

Right side osteoplastic flap, after Wagner, was made with Sudek's fraise, with electric motor, to puncture the ventricle and to relieve pressure. The ventricle was struck without any difficulty, but only a few drops of serum appeared through the cannula. The patient's condition forbidding any further interference, none such was attempted. Replacement of the flap, dressing, patient put to bed. Temperature kept on rising, condition of the patient stayed the same till, eight hours after the operation, exitus took place.

*Autopsy*, by Dr. Schwyzer.—Cadaver of a moderately large boy, no œdemata, no atrophy. Skull shows small Wagner flap on the right side. Cranium not quite symmetrical, right occipital portion somewhat larger than left, bones remarkably thin; the dura tense, rather moist; vessels of the dura rather empty, sinus longitudinal, contains no blood; the lymphatic vessels appear to be imbibed with blood. Subdural space fairly moist, pia shows considerable arterial and venous injection. At the right side under the dura, corresponding to the parietal flap (which corresponds to the flap incision), is a plaque of coagulated blood of the thickness of several millimetres.

The corpus callosum, especially in its anterior portions, arches forward and appears quite resistant. After the brain has been removed, a round, dark tumor of the size of a plum is discovered in the region of the Chiasma opticorum. (Figs. 3 and 4.)

Both olfactory nerves apparently unchanged. The optical nerves appear to be spread and extend backward in a sagittal direction before converging.

To the right and left upon the cystic tumor protuberances like varices appear, which are filled with dark-colored blood, partly fluid, partly coagulated.

Puncture of the central portion of the tumor in the median line reveals a thick, bloody fluid containing many small, yellowish particles of tissue and fat crystals.

The tumor before incision was almost round, with a longitudinal diameter of about four to five centimetres; its anterior walls are quite thin.

The Sella turcica is remarkably deep, its posterior edge is corroded, quite sharp and projecting straight upward. The anterior edge also shows a distinct line of corrosion. The Sella turcica measures almost 3 centimetres in a sagittal direction, 3.5 centimetres across, and 1.5 centimetres in depth. The hypophysis cannot be found, so that the tumor must be looked upon as a tumor of the hypophysis. The portions of the tumor which lie in the lateral depressions of the Sella turcica, and the posterior parts of the tumor, contain grayish-red tissue, which, however, does not represent coagulated blood. The lateral sinuses contain fluid blood.

The left lateral ventricle contains a little clear fluid, the right a few drops of the same.

*Addenda.*—The tumor has a length of  $4\frac{1}{2}$  centimetres, a width of  $2\frac{1}{2}$  to 3 centimetres, and about an equal height. The olfactory nerves are not attacked, but the region of the Chiasma opticorum is involved. The veins at the base of the cranium (sinus cavernosus) are enormously dilated, and stretch in thick cords transversely above and below the tumor. The sinus intercavernosus anterior and posterior, especially, are transformed into wide canals. The tumor itself represents a cyst-like swelling filled with partly coagulated, partly half-fluid blood. In removing the brain, a small rip of the cyst occurs, from which soft, partly black, partly brown coagula and fluid blood are evacuated. In conjunction with these substances, soft gelatinous tissue of yellowish and brownish color are found, which represents the tissue of the cyst. The tumor is most firmly adherent to the Chiasma opticorum. An attempt to sever the tumor from the latter shows that the anterior branches of the chiasm are intact, while the posterior portions are wanting, *i.e.*, they seem to disappear in the cyst. No trace of the hypophysis can be found.

Microscopical examination of the cyst shows that the anterior portion of the tumor is practically one cyst, filled with blood; in the posterior portion it is solid tissue. The coagulated blood contains small particles of tissue, some of which possess the character of papillæ of cystadenoma. The wall of the cyst in its outer portions consists of fibrillary multinuclear connective tissue, while the inner layer is formed of small-celled tissue. The posterior



FIG. 3.—Base of brain showing tumor in situ.

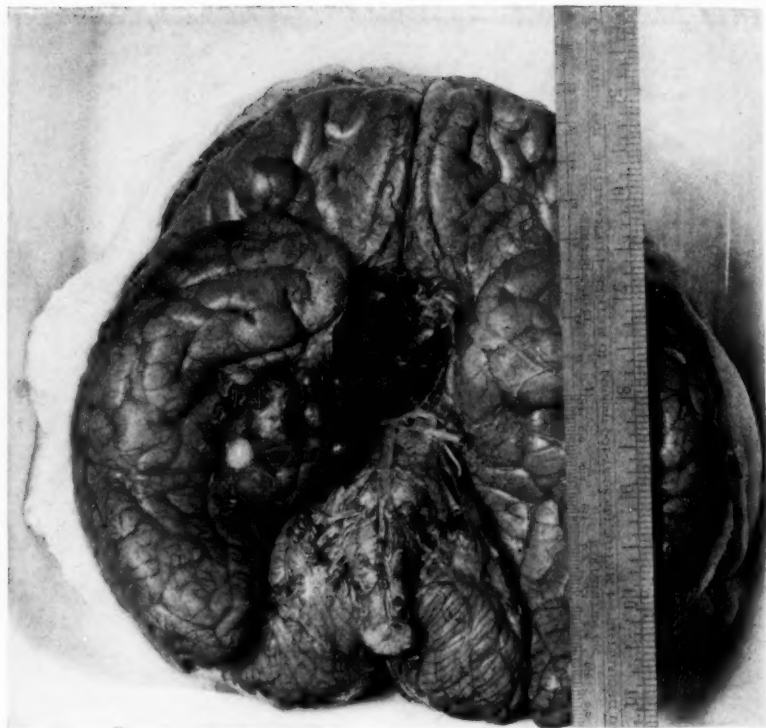


FIG. 4.—Tumor dislodged and held to one side by a pin, showing course and condition of optic nerves.



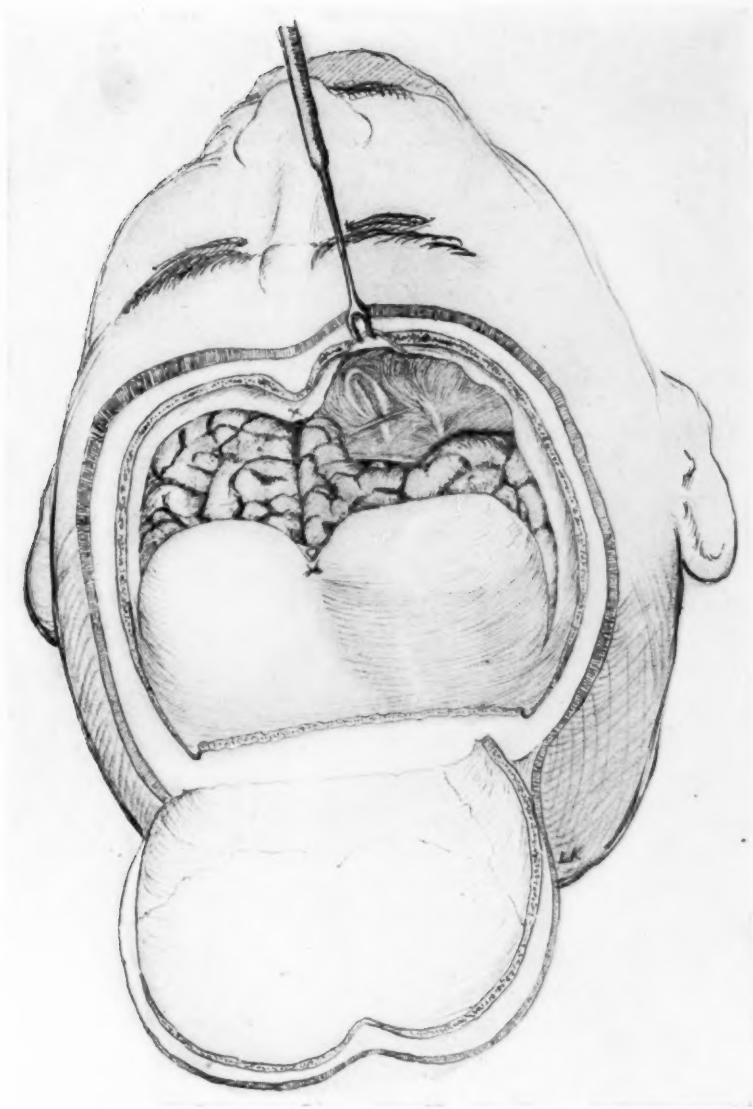
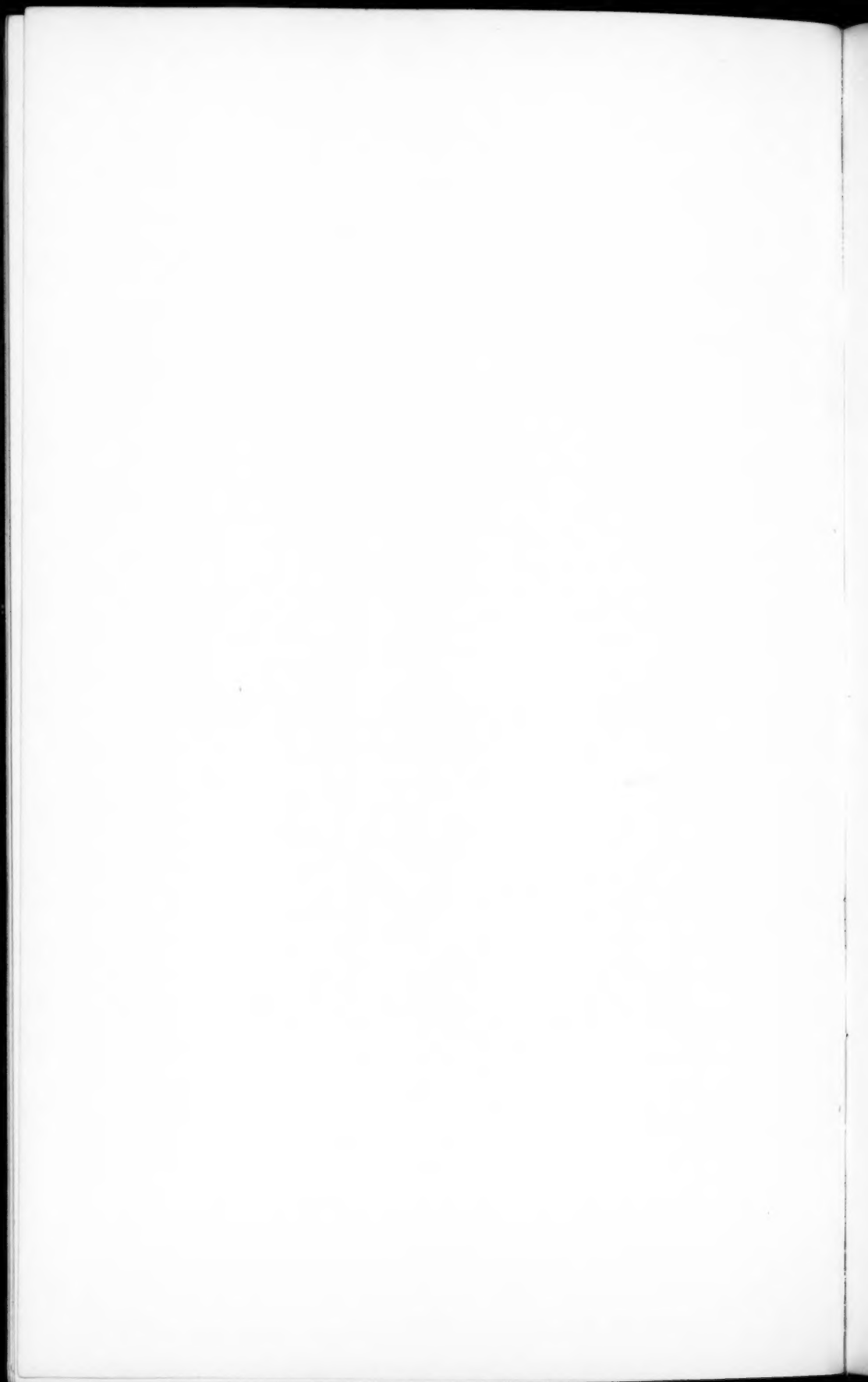


FIG. 5.—Proposed method of reaching tumors of the optic chiasm.



portions of the tumor show glandular tissue here and there, with cystic spaces filled with large colloid masses and with large epithelioid cells. Often the structure of a cystadenoma is clearly shown, but the adenoma-cells are relatively small. The stroma of the entire tumor consists partly of pigmentary cells; many parts of the posterior portion are more like connective tissue, with many blood-vessels and no glandular character, so that they might almost be looked upon as sarcomatous tissue.

*Diagnosis.*—Adenoma of the hypophysis with colloid degeneration resulting in compression of the basal venous system and partial destruction of both optic nerves. Finally, a hæmorrhage in the cysts of the tumor led to a rapid increase of volume with almost complete interruption of the optic nerves.

I may state right here that the rather unusual character of the tumor with its enormous vascularization would have forbidden absolutely any attempt to remove it, as a fatal hæmorrhage would have followed any such attempt most assuredly.

In looking through the literature, I found quite a large number of cases of tumors of the region of the chiasm. While I have not been able to follow all these cases, I have personally been able to trace forty-two, quite a large number of which are cases of acromegaly, the others being tumors of the pituitary body without any symptoms of that disease. It is therefore only natural to consider the possibility of reaching these tumors by operation, and I dare say that if most of these cases did not come under the observation of the nerve and eye specialists, as is natural, the idea of an operative interference would probably have been approached before; if such has been the case, I am not aware of it, at least I have not been able to find anything about it in the literature.

If the region of the chiasm can be reached at all for technical or anatomical reasons, the operation may be indicated either for purely symptomatic causes or for curative purposes. The presence of a tumor at the chiasm probably never makes itself manifest till pressure on the optic nerves ensues. Therefore an operation would in a certain way always have to be for

symptomatical reasons; this all the more as the tumors of the hypophysis have not the tendency to sarcomatous degeneration common to other parts of the brain. This is another reason which makes these operations appear desirable, as the final prognosis is decidedly better and more encouraging than with other parts of the brain, these tumors proving to be of a non-malignant character. The question of acromegaly and its possible treatment or cure by operation on the hypophysis is a matter rather difficult to discuss as long as the opinions about the etiology of that disease are so divided. If hypertrophy of the hypophysis is only one of the symptoms of acromegaly, like the hypertrophy of other extremities, operative interference for total or partial removal would not be indicated until the tumor exerts pressure on the chiasm. If, on the other hand, the disease, as such, was produced by the original hypertrophy of the pituitary body, an early operative interference might be of some avail.

The reason why tumors of this locality have so seldom been operated upon lies entirely in the difficulty of reaching them. The attempt to get at the chiasm by a temporal flap, lift up the temporal lobe of the brain, and work one's way along the pars petrosa of the temporal bone is frustrated by the extremely dense adherence of the dura to the bone. Even if we should succeed in reaching the anterior foramen lacerum between the canalis caroticus and foramen ovale, we would find ourselves behind the Sella turcica, in fact, behind the processus clinoidus posterior. Besides, a very large side flap would have to be made in order to lift up the brain high enough not to work entirely in the dark.

Several years ago I was impressed with the desirability of reaching the chiasm, and therefore tried the following modus: A modified operation after Kroenlein's method for reaching the rear parts of the orbita was considered feasible by combining it with a large frontal flap. The idea was then to break this large frontal flap downward in such a way that, after its detachment from the zygomatic process, it could be turned downward forward, bringing with it the entire upper

roof of the orbita. This operation having been done several times on the cadaver, it was attempted in a case where the diagnosis of tumor of the chiasm was made. The operation had to be discontinued, as it was impossible to break out the flap. The autopsy showed that an enormous sarcoma of the brain existed, with no symptoms except those produced by pressure on the chiasm, combined with a very extended osteosarcoma of the skull, which easily explained the impossibility of breaking out the flap. But I have convinced myself since then that any extra dural operation is without value in an attempt to reach the chiasm, as the same difficulties meet us here that we find in the operation with the side flap, namely, the dense attachment of the dura to the bone. Therefore intradural operations had to be decided upon for this purpose. Besides, there is another objection to this way of opening the skull, as many surgeons may be loth to break the roof of the orbita in the proposed fashion, as one cannot be reasonably sure how it is going to break, and even possible injury to some of the veins may result.

I therefore came to the conclusion that the only rational way of getting at the chiasm was in the following manner: A Wagner flap is formed on the frontal bones with true omega shape, the base of which lies about half an inch behind the sutura coronaria, the indentation of the omega comes to lie exactly in the median line, to avoid, if possible, the opening of the sinus frontalis. The dimensions of the bone flap thus formed are in the median line 5 inches, the lateral diameters being  $5\frac{1}{2}$  inches, the width 7 inches, and the base where it is broken off  $3\frac{1}{2}$  inches. The skin incision severs the temporal artery on both sides. The opening of the skull is made with a Sudek's fraise with electric motor beginning at the base of the flap, the fraise is then led on forward, following closely the line of the omega formed in such a manner that the distance of the horizontal branches from the orbital margin is three-quarters of an inch, then going upward to describe the indentation for the purpose of avoiding the sinus, thus reach-

ing a height of one and one-half inches from the root of the nose. The other half of the flap is symmetrical.

After a number of discouraging experiments, I have been able to bring the time for cutting the bone down to eight minutes.

The failures in my former experimental efforts were due entirely to the fraises not being sharp enough and too softly tempered. The electric motor is of one-quarter horsepower with the usual 120 voltage of the street current. I attach a great deal of importance to the quick work of the fraise, because the danger of forming such a large flap is decidedly lessened if there is less loss of blood by quick work. Any injury to the dura can easily be avoided if the instruments are well made, that is, if the protective knob of the fraise is perfectly smooth. After this a Gigli director is inserted from the starting to the finishing point, and the flap sawed through, or at least partially. After breaking the flap, the incision in the dura is made, following the line of the bone closely in the distance of half an inch up to the median line, where the sinus is left intact. The other half of the incision is symmetrical to the first. We now tie the longitudinal sinus, which is only a small vein at this place. The ligation is best made by first applying two clamps, between which the falx is cut through, and then the ligatures applied. The dura need not be dissected back any further, thus avoiding undue oozing. Now begins the work of the lifting up and out of the frontal lobe of the brain, which is done with two brain spoons. The frontal lobe can thus be shoved back without any trouble or hæmorrhage, till the optic nerve comes into view. The only disadvantageous thing liable to happen is the tearing off of the olfactory bulb of one side. I have used this method now repeatedly on the cadaver, and cannot find any objection to it, as far as one can judge from operations on the cadaver. (Fig. 5.)

The principal danger in most brain operations is, of course, hæmorrhage, but during the steps described it is almost inconceivable that a hæmorrhage of any importance can occur. Thus far I have only described how to reach the anatomical

point desired. What is then to be done depends on the character and size of the tumor to be found. The danger of hæmorrhage now to be encountered is especially from the intercavernous sinus. Cysts of the hypophysis, which are not at all infrequent, would of course lend themselves most easily to treatment by evacuation, while adenomata, if they are not too hard, will permit of a partial removal by the sharp spoon. Any hæmorrhage occurring now, I would try to stop by temporary tamponade, and finally by laying a thin piece of rubber tissue on the surface, and allowing the brain to drop back into place.

I am quite aware how awkward it must appear to recommend an operation which I have only been able to try on the cadaver. But these cases are, after all, not so frequent that one surgeon would see many of them. Therefore I bring this operation to the attention of surgeons.

## PRIMARY CHOLECYSTECTOMY: SCOPE, METHOD, AND RESULTS.<sup>1</sup>

CONCLUSIONS FROM FORTY-TWO CASES IN THE PRACTICE OF THE AUTHOR.

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THE subject of gall-bladder surgery has become altogether too extensive to be considered in any paper of ordinary length. It will be best, therefore, to take one phase of the subject, even though it be but a small part of the whole, and, in viewing this from the stand-point of individual experience, we shall, perhaps, find interest and profit.

The following paper is based upon my own work in primary cholecystectomy gained from forty-two cases in which this operation was performed.

Courvoisier,<sup>1</sup> in an article on cholecystectomy in Kocher's "Encyclopædia of Surgery," states that the first extirpation of the human gall-bladder was performed on July 15, 1882, by Langenbuch. His example was soon followed by Courvoisier, Riedel, Thiriart, and Krönlein.

The operation as a primary procedure has for some reason not become popular. The indications for its performance as stated by various authors (Riedel,<sup>2</sup> Davis,<sup>3</sup> Kehr,<sup>4</sup> W. J. Mayo,<sup>5</sup> Courvoisier,<sup>6</sup> M. H. Richardson,<sup>7</sup> and others) embrace:

First. Serious injuries of the gall-bladder. Second. Grave diseases of the gall-bladder, such as suppuration, atrophy, and cancer. Third. Repeated or complicating gall-stone disease. Fourth. Obliteration of the cystic duct.

Practically, all agree that ulceration and gangrene are indications for the removal of the organ, but Ochsner<sup>8</sup> says:

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<sup>1</sup> Read before the New York Surgical Society, March 9, 1904.



"It is not wise to operate during the acute stage of cholecystitis," an opinion not verified clinically by the writer.

Nearly all authors seem to regard cholecystectomy as a graver surgical procedure than cholecystotomy, and some seem to consider it even more serious than choledochotomy.

It is my conclusion that extirpation of the gall-bladder in non-cancerous cases is a very safe operation, and that it is far more satisfactory in suppurative, calculous, and atrophic conditions than cholecystostomy.

Riedel, in his recent monograph<sup>9</sup> on gall-stone disease, states that, because the extirpation of the gall-bladder requires an incision from thirty to thirty-five centimetres long, the operation cannot be compared with cholecystostomy performed in two stages. I fully agree that if we subject the patient to the terrible shock of a fifteen-inch abdominal wound, especially in septic or weak individuals, the mortality will be far greater than if a cholecystostomy is performed through a four-inch opening. If, however, we can with speed and comparative ease extirpate the organ through the smaller incision, thus completely eliminating a septic focus, and if at the same time we can assure ourselves by actual inspection and all other tests that the common duct is free, and if we can at once remove obstructing stones from the common duct either by incision or by manipulating the calculi out by way of the cystic, it seems to me that the choice of operation must be in favor of the more radical procedure.

Roughly speaking, the cases may be divided into two classes, viz., those in which active infection is present and those in which there is no active infection. If there is no active infection, the matter of drainage of the bile ducts becomes unimportant, and one may as well remove the diseased organ which once has shown a vicious tendency. Yet, even in the second class, when active infection is present, it seems also wise to remove the septic viscus, and, if necessary, drain the biliary system, provided the anatomical conditions are not such as to make prolonged and difficult manipulation necessary. If actual gangrene is left behind, it will continue to be

a serious menace, even though the gall-bladder is thoroughly drained; and, if this gangrene, though very extensive, does not involve the serous coat, one may perform cholecystostomy and never actually know that the gangrene exists.

When for any reason drainage of the biliary system seems desirable, it can be easily accomplished by means of a tube in the hepatic duct; but it seems reasonable enough that when the common duct is free the best drainage of all is the natural one through that structure into the intestine. The only exceptions to this are, first, the presence of septic cholangitis, which is, in any event, probably the most serious of the biliary diseases. Here we may then divert the flow of infectious material directly to the outside of the body. And, second, when there is reason to suppose that fragments of calculi have slipped out of reach into the hepatic duct.

Richardson,<sup>10</sup> in discussing cholecystectomy, mentions three disadvantages:

First. That there is no possibility of draining the biliary passages except through one of the ducts, and that only after a difficult and unsatisfactory operation.

Second. That there is greater danger in the operation.

Third. That redrainage of the biliary passages is extremely difficult and dangerous.

As to the first of these alleged disadvantages, it seems to me that the drainage of the biliary passages by tube at one sitting with a cholecystectomy is far from difficult, and is extremely satisfactory.

As to the second objection, that of danger, I can but say that since I have performed cholecystectomy as a primary measure, my mortality rate in diseases of the biliary passages has fallen materially.

The third objection is perhaps valid, but I have never found it necessary to drain.

The same writer states that he has never had occasion to suspect recurrence of gall-stones after cholecystostomy and drainage, and W. J. Mayo<sup>11</sup> has collected 2000 operations in the hands of six surgeons with no instance of re-formation of

calculi. It would be interesting to know whether in these 2000 cases there has been no recurrence of biliary colic, for it has seemed to me far from rare to hear of pain, in some instances quite severe, after almost any operation for gall-stones. To be sure, this pain has been variously explained as being due to adhesions, to mucus, etc.

It has been my observation that after cholecystostomy secondary operations have not infrequently been necessary, either on account of recurring infections or because of troublesome fistulæ. No secondary operation has been required in any of my patients who have been discharged after cholecystectomy.

My list comprises forty-two cases, counting only those in which the operation has been performed as a primary measure, not after other operative attempts at cure or palliation. The first operation was on May 15, 1900, and twenty-five were done since December 1, 1902. Of the total number, twenty-nine cases were operated upon during the progress of acute active infection and thirteen were in the chronic or latent stage of infection. In one instance belonging to the latter class the gall-bladder was removed, although apparently not diseased.

Of the total number there were ten males and thirty-two females. The youngest patient was a girl eleven years old, whose history has been elsewhere recorded,<sup>12</sup> and who had suffered for years from cholelithiasis. The oldest was a man of sixty-eight, with acute calculous cholecystitis and empyema of the gall-bladder.

A history of antecedent typhoid was obtained in eight cases (19 per cent.).

There was gangrene of the viscus, more or less extensive, in seven of the cases. Choledochotomy was performed six times together with cholecystectomy. Marked jaundice was present in fourteen of the patients. Drainage of the hepatic duct by tube was practised twice. There was a recurrence of pain resembling colic in six of the cases, but in only two did jaundice occur. One of these patients passed two stones after

the cholecystectomy, but her operation was performed before the elaboration of the method which I now employ.\*

The most noteworthy postoperative complication has been a bronchopneumonia, usually on the right side. It was encountered five times.

There has been one death. It was due to streptococcus infection existing before the operation.

In my division at the Mount Sinai Hospital the usual procedure in cases of gall-bladder infection with or without calculi is extirpation, and since adopting this practice the percentage of deaths has steadily decreased. In short, I firmly believe that primary cholecystectomy in the majority of cases is safer than any other operation on the bile passages, even when complicated by jaundice or grave sepsis, and when such procedures as appendicectomy, choledochotomy, gastrorrhaphy, or duodenorrhaphy must be performed at the same time.

Up to the present writing the types of gall-bladder disease which are not considered suitable for cholecystectomy are the following:

First. Extensive carcinoma with involvement of neighboring viscera.

Second. Cholecystitis with large perforations and pericholecystic abscesses, so that on entering the abscess with the finger one at the same time enters the gall-bladder. But even here the procedure will depend upon the extent of the involvement and the condition of the patient.

Third. In cases of known hæmorrhagic tendency.

Fourth. In obviously moribund patients.

The advisability of the radical procedure during the actual progress of a typhoid fever would have to be considered after a review of the facts in the individual case. Even here gangrene would be an indication for cholecystectomy. The question has not yet arisen in any case since I began doing this work systematically.

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\* At the present date (June 22, 1904) this patient has had no pain for nearly a year.

The operation has been greatly simplified by the employment of an operating table with an enamelled iron piece about six inches wide, which may be raised or lowered by means of a crank so as to serve instead of a sandbag or pad under the patient's back. This device permits one to hyperextend the patient to any desired degree of lordosis. The gain in accessibility is really most remarkable.

The steps of cholecystectomy as performed by the writer are as follows:

First, an incision is made from two to four inches long running between the fibres of the upper portion of the right rectus muscle at about the junction of its inner and middle third. The posterior rectus sheath and peritoneum are now incised between mouse-tooth forceps and digital exploration is made. The gall-bladder having been located is drawn towards the external wound. If the viscus is very tense or is supposed to contain infectious fluid, it is isolated by gauze packings, and aspiration is performed in order to empty it as completely as possible. When the walls seem very friable, it is even wise to incise and empty the viscus, closing the opening by ligature or clamp before proceeding with the extirpation. The gall-bladder is usually quite a tough organ, and in the majority of cases it may be grasped with an ovarian ring-clamp applied near its fundus, which at the same time closes the aspiration puncture.

The patient is then placed in the proper position by raising the movable piece of the table for about six inches; gauze packings are laid over the neighboring viscera, and the parts are exposed with the help of blunt retractors. Traction upon the gall-bladder is continued, and an incision with scissors is made through its peritoneal covering at the fundus, about half an inch from its junction with the liver. One blade of the scissors is worked between the serous and fibrous coats of the viscus, and an incision parallel to its long axis is made first on its anterior and then on its posterior aspect. Usually some tough fibrous tissue has to be divided in order to free the fundus from the edge of the liver; then the viscus is further

freed with the finger, taking care not to lacerate hepatic tissue. Hæmorrhage is usually very slight and is easily controlled by packing. Near the cystic duct the connection between the gall-bladder and the liver again becomes more intimate, and it may be necessary to divide fibrous tissue with the scissors, controlling an occasional little spurter with artery clamps. During this entire procedure traction is made by means of the ovarian clamp. When the cystic duct is reached, it is caught with a clamp, the jaws of which are at a right angle with the handles. Now with a hæmostatic needle a traction suture of silk or chromicized catgut is passed directly through the cystic duct about one-quarter or one-third of an inch beyond the clamp (*i.e.*, between the clamp and the common duct). The ends of this suture are tied together, but the suture itself is left free, so that if desired it may be withdrawn after the operation. In order to be prepared for possible accidents, I usually put in two of these sutures. The gall-bladder is now ablated between the clamp and the traction sutures after protecting any visible viscera with gauze. An assistant now makes traction by means of the sutures, raising the cystic duct towards the external wound. If the cystic duct is patent, bile will probably flow and the cystic artery or arteries will spurt. If there is no bleeding, traction on the sutures should be released until the vessel spurts. It is then caught and ligated. This done, the rest of the operation may proceed at leisure.

The cystic duct being now freed from its fibrous connection with the liver, traction upon the sutures will bring the common and hepatic ducts into view, and if the cystic is patent, a large probe may easily be passed under guidance of the eye in either direction. If the cystic is not patent, it is not wise to trust to palpation in determining the presence or absence of calculi in the other ducts, but the cystic should be slit with scissors down even into the common duct, if necessary, or until there is a free flow of bile. In the absence of stones, a large-headed probe may now be passed into the duodenum. Large stones in the common duct may be removed through a prolongation of this slit, and stones from the hepatic



may be brought to the opening by manipulation, or may even be removed through a separate incision into the hepatic duct.

Being now perfectly certain that the passages are free, the incision, if there is one, into the common duct may be sutured, and the cystic, if not slit, may be ligated with chromicized catgut. The suture of the common duct may be so placed that the seam is at right angles to the long axis of the structure if there is any fear that a longitudinal seam might dangerously narrow the lumen. The seam in the stump of the cystic, however, should always run longitudinally, and the duct ligated as if it had not been sutured. It is my custom to leave the chromic gut ligature long, and not to remove the traction sutures, but to permit all the ends to emerge at the abdominal wound. I have rarely found it necessary to sew over the raw surface of the liver, and then only as a hæmostatic measure in persistent oozing.

It is now time to let down the table, and this should be done while the depths of the wound are thoroughly exposed, so that in the event of bleeding, on account of the release of tension as the patient comes into his more natural position, the points of hæmorrhage may be instantly seen and secured.

A slender cigarette drain is carried down to the stump of the cystic duct, and the peritoneum and fascial portions of the wound are closed with chromicized catgut sutures, the skin being approximated with sterile zinc rubber plaster.

The shock following this operation is not usually severe, but an elevation of temperature for the following two days is to be expected. Vomiting is not often troublesome. There is frequently a considerable amount of biliary discharge from the raw surface of the liver, necessitating a change of superficial gauze in two or three days. The drain may be changed in from six to eight days and replaced by a small rubber tube for five or six days longer. The stump, if large, comes away in from ten days to two weeks or even longer; but if the cystic duct was not particularly thickened, its stump may never be seen, the ligature of chromicized gut coming away alone. As soon as the stump or ligature is out, a thick pad, made by







wrapping a wide muslin roller with gauze, is bandaged firmly across the patient's abdomen below the sinus so as to press its walls together. Complete healing is accomplished in about four weeks, but has been secured in so short a time as fourteen days. The average time in the hospital is about three weeks.

The entire forty-two cases are here presented in tabular form, together with the histories of the last twenty-seven. The more interesting as well as all of the unsuccessful of the other cases have been published in other papers by the writer, and in the Mount Sinai Hospital Reports.

CASE XVI.—No. 73,239. *Suppurative Gangrenous Cholecystitis; Cholecystectomy; Cure.*

Mrs. S. S., forty-nine years old, was admitted October 24, 1902. Her past history, with the exception of what was called "nervous dyspepsia" accompanied by heartburn and belching, was negative. Two weeks before admission she began to have cramps, with considerable abdominal distention. The symptoms became more and more aggravated; there was severe epigastric pain radiating into the back, requiring morphine. There had been no vomiting but considerable belching. Urination had been normal; bowels constipated. The epigastric pain, in the beginning of a cramp-like character, became continuous. There never had been jaundice nor chills.

On admission her general condition was found to be fair, the tongue clean. There were a few râles at the left base. The patient was very obese.

In the region of the gall-bladder a tender mass could be easily felt; it seemed to reach to the level of the umbilicus; it had a rounded border and moved with respiration. The abdomen was fairly lax. The entire right side was tender to pressure.

On the day after admission, under chloroform anæsthesia, she was operated upon by the writer. An incision was made about four and one-half inches long between the fibres of the upper portion of the right rectus muscle. An enlarged gall-bladder presented, covered in front over its greater part by a considerably enlarged liver and surrounded by loosely adherent omentum and colon. On attempting to free the gall-bladder from its attach-

ment to the under surface of the liver, it suddenly burst, and considerable thick, purulent matter escaped. The viscus was now slit open and the mucosa wiped dry of pus and extirpation proceeded with. On account of the extraordinarily deep situation of the cystic duct, it was clamped and the instrument left *in situ*. The stump was cauterized with pure carbolic. Cigarette drain and partial layer suture of wound.

The gall-bladder, examined after its removal, was found to be greatly thickened; there were numerous ulcerations and points of gangrene, but no calculi.

A right-sided postoperative pneumonia somewhat delayed convalescence.

Five days after operation the clamp was removed and discharge of bile from the wound began. The biliary discharge ceased about November 15 and the patient was discharged well on December 3, thirty-nine days after operation.

CASE XVII.—No. 73,373. *Cholelithiasis; Common Duct Impacted Stone; Cholecystectomy; Recovery; Relapse.*

Mrs. A. S., aged thirty-one years, had had numerous attacks of typical gall-stone colic with jaundice. About six weeks before her admission on November 7, 1902, she had had an attack lasting from twelve to fourteen hours immediately followed by jaundice continued for fully two weeks. Two weeks before admission she had passed, following the attack, two gall-stones almost as large as marbles, and since then three others were passed. She was first seen by me in consultation with Dr. L. Stieglitz.

On admission to the hospital there was considerable jaundice. The general physical examination was negative and nothing was palpable.

Operation was performed under gas and ether on November 8. The liver was found somewhat enlarged, and, projecting from its under surface and adherent to the transverse colon and stomach by firm adhesions, was the distended and elongated gall-bladder. Two movable calculi, the size of small marbles, were distinctly felt within the common duct. These stones were forcibly dislodged into the gall-bladder, where they were secured. Cholecystectomy was now done in the usual manner, the ducts, however, being examined digitally, no probe being passed. The wound was closed by suture and strapping.

Her recovery was uneventful, and she left the hospital on December 5, about a month after the operation.

NOTE.—This patient has not remained well, but has had three or four attacks of typical biliary colic and has passed two more stones, the size of small marbles. That these stones were overlooked at the time of the operation seems hardly probable. It is not impossible, however, that this might have been the case, but the possibility of new stones having formed in the ducts cannot be excluded. This patient is the only one who has presented actual proof of recurrence of colic due to stones.

CASE XVIII.—No. 73,578. *Cholelithiasis; Common Duct Stone; Cholecystectomy; Choledochotomy with Suture; Recovery.*

Mrs. D. F., thirty years of age, had her first attack of jaundice shortly after her first confinement, about four years before admission. She was seen in consultation with Dr. Kalisher.

Her present illness had been of eight months' duration, beginning with pain in the back, repeated vomiting of whitish material, but neither chill nor fever. A few days after the onset she had become jaundiced. Since then she had had one or two attacks each week. The jaundice had increased and diminished, but the patient's skin had never been of a normal color. For the past four weeks she had been continuously and deeply jaundiced and had suffered from itching of the skin. There had been considerable loss of weight, twenty to twenty-five pounds.

On admission, the liver in the right hypochondriac region extended well below the level of the umbilicus and into the flank.

On December 2, 1902, under nitrous oxide and ether, a four-inch incision between the fibres of the right rectus was made, the incision beginning about two inches above and extending about two inches below the navel. A short second incision at right angles to the first was made at the level of the umbilicus backward. Cholecystectomy was performed in the usual manner. The entire gall-bladder was found densely packed with stones, and more stones were worked into it from the cystic duct. Exploration of the common duct disclosed a large stone close to the duodenum and very slightly movable. After considerable manipulation, the gall-bladder having been removed, the duodenum was rotated upon its longitudinal axis until the ampulla presented between the duodenum and stomach. This was incised close to the intestine. A large gall-stone was removed after it had been previously crushed with forceps, and a gush of bile at once followed. The

longitudinal opening in the duct was closed with five or six interrupted silk sutures, the seam being transverse. Small strips of gauze were placed on either side and over the line of suture. A cigarette drain was carried down to the stump of the gall-bladder and the greater part of the wound was closed by suture.

The gall-bladder was found to be about five inches long, with its walls somewhat thickened; its mucosa was also much thickened and trabeculated. It contained numerous large, faceted stones. The cystic duct was nearly one-half inch in diameter.

Recovery in this case was prompt, and the patient was discharged on January 12 entirely well. There had never been any leakage of bile.

NOTE.—She has remained well up to the present time and has gained over thirty pounds in weight.

CASE XIX.—No. 73,777. *Cholelithiasis; Stone in the Cystic Duct; Cholecystectomy; Recovery.*

R. P., forty-six years of age, was admitted on the 27th of December, 1902, with a history of biliary colic for about twenty-eight years, during which time she had had about fifteen attacks. They lasted usually for a few hours and were quite characteristic, icteric phenomena invariably following. The longest period of freedom was four and one-half years, but there had been a severe attack lasting two weeks about thirteen months before admission.

Her present history was of four weeks' duration. It began in the characteristic way, but deep jaundice came on and persisted. The liver was not palpable below the free border, but the region of the gall-bladder was very tender on pressure. There was some fulness in the right flank; the abdomen was tympanitic. Temperature was 99° F.; pulse, 90.

On January 3 cholecystectomy was performed. There were some omental adhesions to the fundus which had to be ligated. A stone in the cystic duct was milked back into the gall-bladder. The cystic duct was only about half an inch long and was much dilated. The common duct, also, was very short, and the stone was at the junction of the two. On removal, the gall-bladder was found to be very short, its mucosa injected and thickened. It contained about ten faceted stones the size of peas and numerous very small ones.

Five days afterwards the wound was dressed and the drain changed; the following day the drains were removed. On the

thirteenth day the chromic ligature came away, and on February 4 the patient was discharged recovered.

CASE XX.—No. 73,922. *Ulcerative Cholecystitis; Chronic Appendicitis; Cholecystectomy and Appendicectomy; Cure.*

Mrs. J. K., aged forty-three years, had had numerous attacks of what had been regarded as appendicitis. The first attack had been about eight years before, and the average duration was two days. She had suffered from colitis for many years; never had had typhoid fever.

The present illness had begun about six weeks before with attacks of abdominal pain, worse on the right side and shooting into the shoulders. There had been neither vomiting nor jaundice. The pain recurred from six to eight times a day.

On January 13, 1903, there was a sharp chill with a temperature of 104° F.; constipation, rapid pulse, and positive Meltzer's sign. There was distinct resistance with tenderness in the right hypochondrium. The writer saw the patient then in consultation with Dr. S. J. Meltzer and concurred in the diagnosis of appendicitis with probable cholecystitis. The patient at once entered the hospital, where an immediate operation was performed.

An incision along the border of the right rectus was first made, and an adherent, chronically inflamed, and much thickened appendix removed. A tense and distended gall-bladder, bound down by many firm and organized adhesions, was then found on palpation through the wound. The incision was enlarged upward, making it about four inches in all, and the gall-bladder, after the aspiration of about four ounces of turbid green fluid, was extirpated in the usual way. The gall-ducts were hastily explored, but no calculi were found. The cystic duct was ligated with heavy chromic gut, the stump carbolized, and the wound closed with drainage down to the stump.

The gall-bladder was of about eight ounces capacity; its mucosa was much congested; there were numerous ecchymotic spots and small ulcerations. No cause for the cholecystitis was found.

Recovery was prompt, the patient being discharged well on February 8. For some weeks after discharge this patient had occasional attacks of an anginoid type, the pain shooting down the right arm. Her physician, Dr. S. V. Haas, considered these attacks neurotic in character, and this opinion seemed to be con-



firmed, since they subsided completely under appropriate treatment.

CASE XXI.—No. 74,068. *Post-typhoid Cholecystitis in a Child; Cholecystectomy; Cure.*

M. S., a boy twelve years old, had been discharged from the hospital about three months before after a rather severe typhoid. For about six weeks he was well, and then he had occasional sharp attacks of epigastric cramps. There had been six attacks in all. Pain had been very severe, causing him to cry out and double up. The attacks lasted two or three days. Sometimes they were accompanied by vomiting, at other times not; they were not influenced by ingestion of food. There had been neither jaundice, fever, nor chills.

He was readmitted on January 31, 1903, with a liver palpable below the free border of the ribs and with an undefined, hard, rounded mass, very tender to palpation, in the region of the gall-bladder. There was considerable abdominal rigidity. The urine contained a trace of bile. His temperature on admission was 100.2° F., but it rapidly rose to 104° F., and operation was at once undertaken.

A two-inch incision through the fibres of the right rectus at its upper border exposed the edge of the liver, which almost hid an enlarged, tense gall-bladder. There were a few adhesions about the cystic duct. Aspiration yielded three ounces of fluid, at first clear and watery, then thick pus. The gall-bladder was removed in the usual way, but a slight tear with escape of fluid occurred near the cystic duct, which was then ligated close to the choledochus. The gall-bladder was four inches long; the mucosa much thickened and congested. There were no stones. The wound was closed with layer suture and cigarette drain to the stump.

A report on the fluid showed typhoid bacilli.

The patient reacted well, but on the following day the temperature rose to 101.4° F.; respiration, 36. There was a distinct yellowish color to the skin, which was dry. There was considerable abdominal rigidity.

The drain was removed, and it was found that leakage of bile had occurred, evidently through the accidental tear of the cystic duct, which had not been properly included in the ligature. The white blood count at this time was 30,000. On February 2,

forty-eight hours after cholecystectomy, the patient was once more anæsthetized, the wound reopened, adhesions freely broken up, and the space between colon and right kidney, which contained a considerable amount of purulent, bile-stained fluid, washed out. The wound was drained and packed. A culture of the fluid from the free peritoneal cavity showed the presence of typhoid bacilli.\* The peritonitis gradually yielded, and on February 7 the ligature came away. On March 2 the patient was discharged well.

CASE XXII.—No. 74,301. *Cholecystitis; Cholelithiasis; Common Duct Stone; Cholecystectomy; Choledochotomy; Recovery.*

Mr. J. A. U., sixty years old, came to me on February 11, 1903. For ten years he had had attacks of "stomach trouble," paroxysms often coming on as frequently as once a week. He had never been jaundiced and vomited rarely.

The present attack had come on a month before, with jaundice gradually becoming more pronounced, until the icterus was as marked as I have ever seen it. There had been dull abdominal pain, never localized nor radiating. There had been neither vomiting nor headache, nor anything resembling biliary colic. He had lost considerable weight and strength. The diagnosis lay between carcinoma and chronic gall-stone obstruction.

On examination, a fairly firm, rounded mass, absolutely not tender, was made out about three fingers' breadths below the right costal border. His physician, Dr. Manges, agreed with me that an exploratory operation was indicated, so Mr. U. was admitted to the hospital on February 24, 1903, and after careful preparation operation was undertaken on February 26.

Nitrous oxide and ether were the anæsthetics selected. The usual right rectus incision, about four inches in length, disclosed a contracted gall-bladder containing several stones and with many neighboring adhesions. The ducts were palpated and seemed to be empty. During this manipulation a small structure was found adherent to the common duct. It was at first considered to be a gland, but when removed it appeared as a hard, white, completely spherical mass about one-fourth inch in diameter. On section it had a thin, hard shell with pulpy contents. Dr. F. S. Mandle-

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\* Cultures in this case were made by Dr. E. P. Bernstein of the Pathological Department.



baum, Pathologist, reported it to be a degenerated and calcified epiploical appendage. The gall-bladder was now dissected out from the liver, rupture of the organ occurring during the procedure. The bile was sponged away, and eight rounded yet slightly facettted stones, each one-fourth to one-half inch in diameter, were removed. The bile began to flow so profusely that a temporary ligature was passed around the cystic duct to control it. The common duct was considerably thickened, so that palpation was not quite satisfactory, and accordingly two silk guide sutures were passed through this structure and the duct incised in its long axis. The probe passed readily into the duodenum. The duct was now sutured with silk, so that the seam ran transversely to the long axis. Evisceration of the mucosa of the gall-bladder was now attempted, but so much hæmorrhage was encountered that complete extirpation was considered safer, and was accordingly performed. The coats were tremendously thickened; the mucosa was very succulent and vascular. The wound was sutured, except the skin, which was closed by strapping, and the usual drain was carried down to the cystic duct.

At my first visit the following day I found my patient reading the newspaper. His recovery was ideal; and there never was the slightest leakage while he was in the hospital, but a sinus persisted long after his discharge, which took place on March 23. It finally closed, however, after a sudden profuse discharge of bile, and the patient has remained in perfect health.

CASE XXIII.—No. 74,327. *Cholecystitis; Cholelithiasis; Chronic Appendicitis; Cholecystectomy; Choledochotomy with Drainage; Appendicectomy; Recovery.*

Mrs. C. F., aged twenty-nine years, patient of Dr. M. Rosenthal, had had typhoid when she was twelve years old. For the four years before her admission to the hospital on February 27, 1903, she had had frequent attacks of typical biliary colic with pain, jaundice, fever, chills, vomiting, clay-colored stools, and dark urine. Two gall-stones had been passed with stool seven months before. The jaundice had never been persistent, and was most marked after a severe attack of pain. For the ten months previous to admission she had had attacks at very frequent intervals. She had lost twelve pounds in weight; her appetite had been poor; bowels constipated.

On examination her general condition was fair; tongue moist

and clean; slight subconjunctival icterus. The liver percussed one finger's-breadth below the costal border in the mammary line, otherwise it did not seem to be enlarged and was not palpable. No mass could be felt.

On February 28, under gas and ether anæsthesia, I operated through an incision two and one-half inches long between the fibres of the upper part of the right rectus. A small gall-bladder with very much dilated but short cystic duct was removed. It contained thick bile, some of which escaped on account of the tearing out of the clamp which held the viscus. The common duct was secured by two silk traction sutures and longitudinally incised for about half an inch below the junction of the cystic. A soft, pigmented stone was removed in fragments from the common duct, and a large-headed probe was then passed on into the duodenum. A tube was pushed into the common duct and was held in place by sutures passing through the duct, but not through the tube. This tube was inserted about one inch towards the liver into the hepatic duct.

The appendix had been previously found and marked with a ligature, which was left in the wound. It was now again drawn into the wound and appendicectomy performed. The wound was closed by suture and adhesive plaster, the tube in the duct being left long, so as to drain outside of the dressings.

The serosa of the gall-bladder was found much thickened; the mucosa pale and thick. The total length of the organ was about three inches. The appendix was five and one-half inches long, its lumen for the proximal, three and one-half inches, being obliterated, and its last two inches being represented by a tapering fibrous cord.

The tube was removed from the duct on March 6, and on the 25th the discharge ceased. Patient left the hospital on March 27, four weeks after the operation.

NOTE.—She has had several attacks of biliary disturbance with jaundice since the operation, and I have advised her to submit to another operation if a thorough trial of medical treatment should fail. Possibly an erosion due to the presence of the drainage tube resulted in a cicatricial stricture of the hepatic duct, and it is not unlikely that with the atrophy of the cicatrix the patient may be relieved. At any rate, the cholecystectomy can in no sense be blamed for the recurrence of symptoms, for a choledochotomy was in any event indicated.

CASE XXIV.—No. 74,343. *Acute Cholecystitis; Cholelithiasis; Cholecystectomy; Recovery.*

Mrs. R. F., thirty-two years old, a patient of Dr. M. Schiller, had suffered from a typical attack of gall-colic three months before. The pain had been severe and was accompanied by vomiting and diarrhoea. Jaundice had appeared on the second day and had continued for forty-eight hours. About six weeks later she had had a similar attack lasting only one day, and not accompanied by jaundice. There was another slight attack in two weeks, and then on February 25 the most severe attack of all had begun. Every motion was painful. The patient was very constipated and vomiting was frequent. There had been chills and fever, the temperature rising to 105° F.

On examination a tender point was found in the right iliac region, but rigidity was most marked over the upper right rectus. No tumor was felt, the patient having a thick panniculus, and being difficult to examine. There was no jaundice.

The writer advised operation, which was accepted, and the patient entered the hospital on March 1, 1903. Under nitrous oxide and ether anæsthesia an incision about five inches long between the fibres of the right rectus was made. The gall-bladder was very deeply situated; it was congested and thickened, but there were no adhesions. The viscus was very tense. About three ounces of bile and pus were aspirated in order to relieve tension, and the gall-bladder was then easily peeled away from the liver. The viscus was now removed, the cystic duct being ligated separately, and the ducts thoroughly explored. Numerous small cholesterin stones were found in the gall-bladder, which had contracted until it was only about three inches long, although it was very much larger when distended. Its walls were very thick; the mucosa congested and trabeculated, but there were no ulcerations nor gangrene.

On March 6 the drain was removed and a tube inserted. Recovery was ideal, the patient being discharged well on March 22, three weeks after operation.

NOTE.—The patient has remained free from biliary disease.

CASE XXV.—*Cholecystitis; Cholelithiasis; Cholecystectomy; Recovery.*

A. S., twenty-five years old, was admitted on the 14th of March, 1903, with a history of attacks of biliary colic dating from

three months before. The diagnosis of cholelithiasis had been made, but in spite of careful search no stones had ever been discovered in the stools.

The attack for which he sought relief on admission had been of seven days' duration, coming on immediately after a light meal, with cramp-like epigastric pains radiating towards the lower right costal border. There had been vomiting, but neither chill nor fever. Constipation, but no jaundice.

When I first saw him his general physical condition was good; temperature 100° F.; pulse not accelerated. There was rigidity of the upper part of the right rectus with tenderness on percussion. The liver was palpable one finger's-breadth below the ribs.

On March 17, under ether anæsthesia, cholecystectomy was performed through a four-inch incision through its rectus. The gall-bladder was readily dissected from its peritoneal hepatic attachment. It was very tense, fully six inches in length, and its walls were much thickened. A large calculus was felt in the cystic duct and forced back into the gall-bladder. After digital exploration of the hepatic and common ducts, the cystic was ligated, the gall-bladder cut away, and the stump carbolized. The wound was closed by suture of deeper tissues and strapping of the skin, a small cigarette drain being carried down to the stump.

On opening the gall-bladder it was noted that the mucosa was covered with many small ulcers, and that the viscus contained eight calculi from one-quarter to two-thirds of an inch in diameter, as well as a multitude of small ones. On March 21 the wound was dressed and the drain replaced by a small tube. There had been a slight bronchopneumonia from which the patient was convalescent. On April 4 he was out of bed, and on the 8th, twenty-two days after operation, he left the hospital, the wound entirely healed. He remains perfectly well at the present writing.

CASE XXVI.—No. 74,786. *Cholelithiasis; Appendicitis; Cholecystectomy; Appendicectomy; Recovery.*

S. G., twenty-one years old, was admitted April 19, 1903. She had been discharged from this hospital two weeks before, the diagnosis of cholecystitis having been made and operation having been refused. The biliary colic and fever having returned, she again sought relief, this time accepting operation.

On admission her temperature was 101° F.; pulse, 112.

There was acute tenderness in the region of the gall-bladder, but no mass was palpable, in spite of the fact that her abdomen was lax. Considerable tenderness in the right iliac region made the diagnosis of appendicitis also probable.

On April 21, under nitrous oxide and ether followed by chloroform, I performed cholecystectomy by the usual method. The case was a very simple one, and it is not necessary to go into it in detail. The common duct was free. A separate incision through the right rectus in the iliac region was now made and the appendix removed.

The gall-bladder was five inches long; its walls not particularly thickened. It contained forty-three faceted stones of various sizes. The appendix showed evidences of chronic inflammation.

Four days after the operation the small drain was removed and replaced by gauze. The patient was discharged well on the 13th of May, twenty-two days after operation.

CASE XXVII.—No. 74,844. *Acute Ulcerative Cholecystitis; Cholelithiasis; Cholecystectomy; Recovery.*

A. T., aged sixty-eight years, came to the hospital on the 25th of April, 1903. His past history bore no direct relation to his disease, which had begun three days before with lancinating pain in the lower right chest, much increased by the motions of respiration. There had been no cough and no chill, but some fever. Considerable nausea. There was constipation, but no jaundice.

His general condition was quite good, but there was some pulmonary emphysema. There was great tenderness over the entire right upper quadrant of the abdomen. The free border of the liver could be distinctly palpated at the level of the umbilicus and the gall-bladder quite well made out. Rigidity of the right upper quadrant was marked.

This patient was considerably prostrated; his temperature being 103.6° F.; pulse, 120; respirations, 32. Although there was marked tympanites, it was not considered that signs of peritonitis were present.

After three days of general treatment operation was undertaken in chloroform anæsthesia. An incision four inches in length was made in the usual location; the liver was found within two inches of the umbilicus, congested and "nutmeg" in appearance. The gall-bladder was large, apparently thickened;

the cystic duct very much dilated and containing a large calculus. Firm adhesions to the colon and gastrohepatic omentum caused considerable technical difficulty, nearly all of the adhesions requiring ligation. The anæsthesia had been accompanied by considerable cyanosis and the operation had to be hurried. The gall-bladder was removed after ligation of the cystic duct. It was four inches long; its walls near the cystic duct being fully half an inch thick, while near the fundus they were only one-eighth of an inch in thickness. The mucosa was thickened, trabeculated, and near the duct there was a superficial ulceration. Many fragments of a large, soft stone, and innumerable small, brownish-yellow stones, together with several ounces of dark, viscid fluid, almost faecal in appearance, were contained within the viscus.

Recovery in this case was quite slow on account of an intercurrent pneumonia and some suppuration in the depths of the wound. He was, however, discharged entirely well on June 10.

CASE XXVIII.—No. 75,405. *Cholecystitis; Stones in Common Duct and in Gall-bladder; Cholecystectomy; Choledochotomy.*

This patient, Mrs. A. W., was sent to me by Dr. Henry Heiman on April 19, 1903, with a history of typical attacks of biliary colic followed by jaundice, extending over a considerable number of years. She was thirty-four years old, well nourished but not obese, and in excellent general condition. Examination was absolutely negative, and operation was advised solely on the evidence of the history.

On May 10 she entered the hospital and was operated upon the following day. A three-inch incision between the fibres of the right rectus revealed a shrunken, firmly adherent gall-bladder with many stones. The organ was divided into two chambers by a firm cicatricial septum or stricture. The fundus was filled with mucopus, but contained no stones. The other chamber of the organ contained numerous faceted stones, and on palpation a very much dilated common duct, containing many small calculi, was made out. The gall-bladder was removed in the usual way. Two retracting sutures were passed into the common duct and an incision was made between them. There was a free discharge of bile and six stones were removed from the duct, one of which had to be crushed and extracted in fragments. A probe was now passed into the hepatic duct and down into the duodenum. The



common duct was sutured with chromic catgut, so that the seam ran transversely, and the stump of the cystic ligated. The gall-bladder near its fundus had been so intimately connected with the liver that parts of the mucous membrane were left, and these were now destroyed with the actual cautery. Peritoneum and fascia were closed by suture and the skin strapped, the retracting sutures in the common duct being left long.

The gall-bladder proved to be one and one-half inches long, of an hour-glass shape, its walls very thick and friable. There were no ulcerations, but the mucosa was thickened and œdematous. There were twenty-four small, irregular gall-stones.

On May 20, nine days after operation, the wound was found healed with the exception of the drainage opening. On the 31st of May the patient was discharged with a small sinus, which closed a few days afterwards.

NOTE.—In spite of the thoroughness of this operation, the patient had a severe attack of colic about ten days after her discharge. There was no jaundice, however, and Dr. Heiman reports that there has been no other attack, the patient remaining in perfect health.

CASE XXIX.—No. 75,058. *Cholecystitis; Cholelithiasis; Cholecystectomy; Recovery.*

B. H., fifty-eight years old, was admitted on the 16th of May, 1903. For thirty-three years there had been attacks of biliary colic with occasional jaundice, but neither chills, fever, nor vomiting. She had had rheumatism, but not typhoid. For two weeks before admission there had been nausea, with sensations of pressure in the epigastrium, culminating in an attack of colic. The pain recurred, and fever, with a temperature of 102° F., supervened.

On admission a very large mass could be palpated in the region of the gall-bladder, which was extremely tender and firmly elastic. Her temperature was 103° F.; pulse, 90.

Immediate operation was performed through a four-inch right rectus incision curving slightly inward in its upper portion. There were no adhesions, but the gall-bladder was found, the size of an orange, very much distended and extremely tense. Eight ounces of greenish biliary fluid mixed with pus were withdrawn by aspiration. The gall-bladder was now packed off, its fundus incised and a number of medium-sized tetrahedral stones were

removed. The cystic duct was S-shaped, very much dilated, and its walls were soft and succulent. It contained a number of stones. The common duct was very short and very wide. A clamp was applied to the cystic, a ligature placed below, and the gall-bladder cut away. A double-barrelled lumen was noted on examining the stump, further examination showing that this was due to the peculiar curve of the cystic duct. Careful exploration rendered it certain that the common duct had not been implicated in the ligature. The mucous membrane was carbolized and the wound closed with drainage to the stump.

The walls of the gall-bladder were not much thickened, but there were numerous spots of gangrene in the mucosa. The pathological report on the fluid taken from the gall-bladder was negative. (Examined by Dr. Bernstein.)

Convalescence was absolutely uneventful, and the patient was discharged on June 10.

CASE XXX.—No. 75,527. *Cholelithiasis; Cholecystectomy; Recovery.*

S. H., thirty-five years old, was seen by the writer for Dr. I. Strauss early in July, 1903. He had had typhoid fever when he was about thirteen years old and a severe attack of acute articular rheumatism in May, 1900. Seven months before his readmission on July 8 there had been a typical attack of biliary colic without jaundice, the attack continuing for three or four days. Four months later there had been a more severe attack accompanied by jaundice, clay-colored stools, and dark urine. The patient said that he had noticed "sand" in his movements. There had been a succession of colicky attacks for three weeks.

When first seen, in spite of the fact that the patient was quite corpulent, an extremely sensitive distended gall-bladder could be plainly palpated. Temperature about 100° F.; pulse, 84.

On the 11th of July cholecystectomy was performed through a four-inch incision. About twenty stones were milked from the common duct into the gall-bladder. After its removal, the viscus was found to be four inches long and of considerable bulk. The walls were markedly thickened. In addition to a number of smaller stones, one the size of a walnut was found.

In this case no ligature was placed around the cystic duct, but it was closed off by catgut sutures placed so as to bring the serous surfaces together. The wound was closed with drainage to the stump.



Two days after operation the temperature shot up to  $104\frac{1}{8}^{\circ}$  F.; pulse, 140, with occasional vomiting. The dressing was stained with bile and the lower part of the abdomen somewhat swollen and tense. A bile peritonitis was evidently present and a rubber drainage tube was inserted.

Two days later the temperature had fallen to  $101^{\circ}$  F. and the pulse to 100; there was considerable seropurulent, bile-stained discharge. The patient then made a good recovery, and was discharged on August 22.

CASE XXXI.—No. 76,346. *Cholelithiasis; Cholecystitis; Cholecystectomy; Recovery.*

U. D., forty-eight years old, a patient of Dr. Bodenheimer, had had frequent attacks of biliary colic. He had been suffering from indigestion and flatulence, but had never been jaundiced. There was no history of typhoid. For a few days before admission he had had very frequent attacks of biliary colic, and a minute gall-stone had been discovered in the stools on careful straining through gauze. His general condition was excellent, with the exception of a nervous disorder characterized by tremor.

Cholecystectomy was performed on September 30, 1903, under gas and ether anæsthesia. In order to make sure of the patency of the cystic duct, of which there was some doubt, the gall-bladder was slit down to this structure and it was thoroughly explored. Numerous small stones and considerable dark green fluid were found. The cystic duct was tied off with chromic cat-gut and the wound closed with drainage to the stump.

The gall-bladder was but slightly enlarged; its mucous membrane was considerably injected and thickened. It was filled with an enormous number of small, irregular calculi. The pathologist's report on cultures from the gall-bladder contents showed the presence of an actively motile bacillus negative to Gram, but not identified. (E. Libman, Assistant Pathologist.)

Healing was uneventful, the ligature coming away ten days after operation. Twenty-five days after operation the patient was discharged well.

CASE XXXII.—No. 76,534. *Subacute Appendicitis; Cholecystectomy; Appendicectomy.*

T. M., thirty-four years old, was admitted on the 21st of October, 1903. She was single and a domestic.

Her past history threw no light upon the illness for which

she had come to the hospital. This trouble began on October 13, with persistent vomiting and pain in the epigastrium and back. With slight intermissions the pain and vomiting continued until admission. Her temperature had been just over 100° F. There had been neither chills, sweating, nor jaundice. She was sent in by Dr. L. Stieglitz, with a diagnosis of appendicitis. On admission the abdomen was lax, all colic had disappeared, and there was absolutely no tenderness anywhere. There was a trace of bile in the urine.

On October 27 cholecystectomy was performed through a one and one-half inch incision between the fibres of the rectus. The liver presented and the gall-bladder was readily delivered. It was small and apparently normal, as were also the ducts. Cholecystectomy was easily performed, and the wound closed with a small drain to the stump.

This operation was decided upon at the time of the exploratory laparotomy mainly on account of the history and because the patient had stated that her mother had suffered for many years from gall-stones. The writer, not being satisfied that the symptoms had been due to trouble with the gall-bladder, made another one and one-half inch incision over the region of the appendix, and, much to his chagrin, found a well-marked chronic appendicitis with adhesions between the tip of the appendix and the cæcum of such a nature as constituted a typical jug-handle appendix. The organ was removed, the stump cauterized with pure carbolic, and the opening into the cæcum, where the tip of the appendix had been adherent, was closed by suture.

Recovery was uneventful, and the patient was discharged on November 10.

CASE XXXIII.—No. 76,558. *Cholecystitis; Cholelithiasis; Cholecystectomy; Recovery.*

S. R., aged twenty-eight years, was admitted on the 2d of November, 1903. She had had typhoid fever thirteen years before. Otherwise her previous history was negative. The present history had been of nine months' duration, attacks of colicky pain in the right hypochondrium having become more and more frequent, until for a few weeks before admission they had occurred every five or six days. Pain had been exceedingly severe, radiating towards the back, accompanied by nausea and vomiting, with chilly sensations, and followed by weakness and profuse perspira-

tion. There had been no jaundice. The last attack, one week before admission, had continued for twenty-four hours.

Her general condition was good, the skin having a slight, general icteroid hue. The liver was somewhat enlarged, and pressure over any part of this organ caused pain in the region of the gall-bladder, which was distinctly palpable, projecting below the edge of the liver and quite superficial. The temperature was 99° F.; pulse rate, 72.

On November 3, under nitrous oxide and ether anæsthesia, I operated through a two-inch incision in the right hypochondrium between the fibres of the rectus. The enlarged liver and somewhat dilated gall-bladder presented. It was necessary to break up or ligate a moderate number of adhesions. The cystic duct having been exposed, retraction sutures were passed through its walls and the gall-bladder cut away. The cystic artery was secured by separate ligature. The ducts were explored with a probe. The cystic duct was then ligated, the stump carbolized, and the wound closed with drainage by the cigarette method.

The very much thickened gall-bladder contained about two ounces of mucoid material and thirty-four calculi, varying in size from sand to a small marble. The mucosa showed old hæmorrhagic spots.

On November 8, after a smart reaction, the temperature rising to 103° F. and the pulse to 108, the first dressing was done. Primary union was noted, and the drain replaced by a very small tube. On the 22d of November, nineteen days after operation, the patient was discharged recovered.

CASE XXXIV.—No. 73,246. *Cholelithiasis; Cholecystectomy; Recovery.*

E. H., single, nineteen years old, was admitted to the medical service on October 26, 1902, having been sick for ten days. Her illness was characterized by frequent attacks of cramp-like epigastric pain uninfluenced by eating. There had been rather frequent vomiting, at first of food, then of watery, bile-stained fluid. There had been neither fever nor chills.

On examination she was noted to be slightly icteric. There was considerable tenderness in the epigastrium, especially in the median line, about two inches above the umbilicus. The blood count showed 9000 leucocytes and a normal number of red blood-cells. The liver was palpable, and there was some tenderness on percussion over the region of the gall-bladder.

On November 2 there was an attack of gall-stone colic, the blood and urine containing bile, and the stools being clay colored.

On November 11 she was transferred to the second surgical division for operation. Temperature at this time was  $99\frac{1}{2}^{\circ}$  F.; pulse, 82; respirations, 20. Operation was performed in gas and ether anæsthesia followed by chloroform, the usual technique being employed. Incision was two inches long. The omentum was firmly adherent to the entire lower surface of the gall-bladder and had to be freed from it by chain ligatures and section.

The gall-bladder was sausage-shaped, its walls very much thickened, and it contained ulcerations at the fundus. There were one large stone and seventy-nine small facettèd ones. Wound was closed with drainage to the stump.

Six days after operation the first dressing was done, the drain removed and replaced by a small tube. The following day the temperature rose to  $102.6^{\circ}$  F., due to slight suppuration. The ligature and stump came away on the thirteenth day. Suppuration occurred beneath the aponeurosis, and a small counter-incision had to be made on December 20, after which recovery was rapid, and the patient was discharged cured on the 3d of January.

CASE XXXV.—No. 76,767. *Post-typhoid Streptococcus Suppurative Cholecystitis; Pregnancy; Cholecystectomy; Death.*

A. S., twenty-four years old, married, was admitted on November 15, 1903. She had had typhoid fever, for which she had been treated at this hospital in the fall of 1902 and the spring of 1903. During this time there had been evidences of typhoid cholecystitis.

Her present illness had begun about three weeks before admission, with severe pain in the right hypochondrium radiating to the back. The pain recurred in paroxysms, and she had vomited frequently. There had been jaundice since the outset. Bowels had been moved by cathartics.

On admission her general condition was poor; temperature,  $97.4^{\circ}$  F.; pulse, 92. She was pregnant, the uterus extending well above the umbilicus.

On November 16 cholecystectomy through a four and one-half inch incision was performed in nitrous oxide gas and ether anæsthesia, for acute empyema of the gall-bladder.

On opening the peritoneum the gall-bladder was found surrounded by several adhesions, which were easily peeled off without

ligature. The gall-bladder, however, was very firmly adherent to the under surface of the liver and had to be cut away with scissors. During the manipulation, a rent was made through its wall and about three ounces of yellow, foul-smelling pus evacuated. The operation was then completed in the usual manner.

The gall-bladder after its removal was found to be three inches long and its walls considerably thickened. There were no ulcerations. The peritoneum was congested; there were no stones.

A culture from the pus, reported upon by Dr. Libman of the pathological laboratory, showed the presence of streptococci.

The patient did fairly well for the first twenty-four hours. Examination of the blood gave Widal reaction one to twenty. Neither the bile nor the urine reacted to the Widal test. (Libman.)

About the third day after the operation it became evident that the sepsis had not been checked, and from this time on there was a hard fight against the general streptococæmia with pneumonia, and many of the other complications of this dreadful disease. The blood culture, which was taken on the 30th of November, was, however, negative.

After a terrible struggle with temperatures running from 97° F. to 106° F., often in less than twenty-four hours, the patient succumbed on December 8, twenty-three days after the operation.

A wound examination by Dr. Bernstein sixteen hours after death showed hypostatic congestion of the lungs with miliary abscesses; the heart fatty and anæmic; the spleen septic; and the kidneys showing parenchymatous degeneration. An abscess, the size of a walnut, well closed off from the general peritoneal cavity, was found connecting with the lower angle of the wound. The liver showed perihepatitis. Between the under surface of the left lobe and the upper surface of the stomach was a large abscess containing about four ounces of pus. The liver parenchyma was pale and acutely degenerated. On the upper surface of the left lobe were several abscesses from the size of a pea to that of a walnut. The bile ducts involved in a necrotic granular mass could not be dissected.

CASE XXXVI.—No. 76,928. *Cholelithiasis; Gangrenous Cholecystitis; Suppurative Pericholecystitis; Cholecystectomy; Recovery.*

Mrs. R. B., fifty years old, was admitted on December 4, 1903. There had been repeated attacks of severe pain in the epigastrium and below the right ribs for four years, the pain radiating to the back and interscapular region. There had never been jaundice nor fever.

Her present attack had come on several days before with vomiting, constipation, and fever. There was no jaundice. The patient's general condition was wretched. Her temperature was about 100° F.; pulse, 102, and of very poor quality. There was considerable abdominal distention, and an extremely tender mass was palpable below the free border of the right hypochondrium.

Operation was performed the same day through an incision six inches long between the fibres of the right rectus muscle. A mass of adhesions presented. These were carefully separated after packing off the free peritoneal cavity and a considerable abscess was encountered and emptied. The gall-bladder was then seen to be markedly distended and distinctly gangrenous. It was at once aspirated and twelve ounces of dark hæmorrhagic fluid withdrawn. A few stones in the cystic duct were milked back into the gall-bladder. The viscus was then removed and careful exploration of the common and hepatic ducts performed, after which the cystic was ligated and the wound closed with drainage to the stump.

After its removal the gall-bladder was found to be four inches long and two and one-half inches in diameter. Its mucosa in many places was rough and gangrenous, many spots of gangrene passing through to the peritoneum. It contained a large number of yellow stones, varying in size from a mustard seed to a filbert. None of them were markedly faceted. The pathologist's report on a culture from the fluid showed the presence of streptococci. (Bernstein.)

Five days later the wound was dressed for the first time and was found in excellent condition. There was rather a profuse bile-stained discharge. On the 2d of January, 1904, she was discharged recovered.

CASE XXXVII.—*Cholecystitis; Cholelithiasis; Cholecystectomy; Recovery.*

Mrs. K. G., twenty-nine years old, had been sick for three and one-half years with the typical symptoms of biliary colic. She had lost thirty pounds during the past two years. She



entered the hospital on December 29, 1903, in a rather mild attack accompanied by jaundice. She had been referred to me by Dr. T. T. Gaunt.

The liver was palpable at the free border; the gall-bladder could not be felt.

On January 2, 1904, cholecystectomy was performed for stones. There were a few adhesions around the gall-bladder, but the ducts were free.

On its removal the gall-bladder was found thickened, the mucosa hæmorrhagic, and there were four stones from one-half to one inch in diameter.

This patient had several attacks of colic during her convalescence, but without jaundice. They gradually disappeared, and she was discharged well on the 22d of January, twenty days after operation. She remains well at the present writing.\*

CASE XXXVIII.—*Cholelithiasis; Cholecystectomy; Cholechootomy; Recovery.*

Mrs. L. G., aged forty-four years, was admitted on the 1st of January, 1904.

For the previous four years she had had innumerable attacks of biliary colic with chilly sensations and jaundice. The attacks usually lasted three to four days and then most of the symptoms subsided. The jaundice had not disappeared after the last attack, which was several weeks before admission, and the patient had lost considerable weight and strength. The itching was very severe; there was no fever.

A large Riedel's lobe could be made out on the right side; the left lobe could be plainly felt below the free border of the ribs. On inspiration, there was a point of tenderness just to the right of the umbilicus.

On January 5 operation was performed. The gall-bladder was found embedded in Riedel's lobe; there were numerous adhesions to surrounding structures. Stones were present in all three ducts and the common duct had to be incised.

The gall-bladder on removal was found greatly thickened; there were several stones, two large ones being respectively one-half and three-quarters of an inch in diameter.

She was discharged after an uneventful convalescence, the

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\* June, 1904. Patient complains of "indigestion," with pain after eating meat and with considerable belching.



wound healing to a very short sinus twenty-four days after operation.

CASE XXXIX.—*Cholelithiasis; Stones in Cystic and Common Ducts; Cholecystectomy; Choledochotomy; Drainage; Cure.*

Mrs. A. R., patient of Dr. W. M. Brickner, was admitted to the hospital on the 8th of January, 1904. She was thirty-nine years old. Her mother had died of "gall-stones."

Nine years before admission she had had recurrent attacks of colicky pain which had become more and more frequent. The colic had usually lasted from four to six hours, and there had been vomiting, nausea, jaundice, and itching of the skin. There had never been fever nor chills. The jaundice had usually disappeared in about fourteen days. Between attacks the patient said that she felt perfectly well.

On examination the gall-bladder was not palpable, but operation was decided upon because of the history. It was performed on January 9 under gas and ether.

Riedel's lobe extended to the level of the umbilicus; the left lobe of the liver was also enlarged, and the gall-bladder surrounded by adhesions. There were stones in the cystic and common ducts but none in the gall-bladder. The common duct had to be incised for a considerable distance in order to remove a large, soft, friable stone. Because of the character of this stone and because I feared that some of the fragments had slipped into the hepatic duct, I decided to drain the hepatic. This was done by tube, the remainder of the incision in the common duct being closed by suture.

Convalescence was uneventful, and the patient was discharged on January 29, 1904.

CASE XL.—*Acute Gangrenous Cholecystitis; Cholelithiasis; Cholecystectomy; Cure.*

Mrs. A. H. P., thirty-five years old, had always suffered from "stomach trouble." Her first attack had come on about fourteen years before. She had never been jaundiced, but had had attacks every few months. About twelve years before there was a very severe illness with pain in the right hypochondrium.

Her present illness had begun on January 16 with nausea, vomiting, and epigastric pain shooting to the back and arms. Four days later there had developed a distinct tumor in the right hypochondrium with decided general icterus. There was great weakness. I then saw her at the request of her physician, Dr.

Follen Cabot. Operation was proposed and accepted, and she entered the hospital on January 20.

The usual operation was performed, a large, tense gall-bladder being encountered. Ten ounces of dark brown, thin fluid were removed by aspiration. Numerous stones were felt within the viscus; the ducts were free.

The gall-bladder after removal was six inches long, its walls one-half inch thick, covered with ulcerations and with numerous points of gangrene. There were 268 stones from the size of a small shot to that of an almond.

The pathological report on the fluid from the gall-bladder showed staphylococcus aureus.

The first four days after operation the nausea and vomiting were unchecked, but there was no sign of peritonitis. The urine contained acetone in considerable quantity and diacetic acid. During this period the temperature did not reach higher than 101.4° F., but the pulse was extremely rapid, of very poor quality, and the patient's condition seemed precarious. For three days she did not sleep at all, and then at the suggestion of Dr. Manges, who was asked to see her by Dr. Cabot, she received by rectum twenty grains of veronal, after which she slept, and from this time her convalescence was uneventful. She was discharged on February 9, twenty days after operation.

CASE XLI.—*Obliterating Cholecystitis; Adhesion to the Walls of a Defect in the Duodenum; Cholecystectomy and Duodenoplasty; Recovery.*

M. P., thirty-five years old, was admitted to the service of Dr. Manges on January 12, 1904. He had begun thirteen months before to suffer cramp-like pain in his abdomen after eating. There had been one attack of jaundice. The pain had been most severe at the pit of the stomach, with radiation into the back and shoulder. It was relieved by vomiting. The patient had lost weight steadily, and there was slight cough with mucopurulent expectoration. Blood had never been noted in the stools nor in the vomiting material.

On examination an area of tenderness was found in the left epigastric region, but there was no rigidity. The stomach was not enlarged to percussion. There was no tenderness in the region of the gall-bladder. On inflation the stomach showed no enlargement below the umbilicus. The blood was examined for bile, but none found. The urine was clear, amber, sp. gr. 1012, daily

amount fifty-five ounces. A faint trace of albumen was present, with 1.5 per cent. urea and numerous hyaline and granular casts. Repeated examinations of the gastric contents had demonstrated the presence of a sufficient amount of free hydrochloric acid. The weight of the patient on admission was 125½ pounds, and a month later, in spite of treatment, it had fallen to 107½ pounds. His weight in health was said to be 160 pounds.

The working diagnosis of ulcer of the duodenum made by Dr. Manges gave with the history of the case sufficient reason for advising an exploration.

On February 12, under gas and ether anæsthesia, the right rectus incision was made for the purpose of exploring the pylorus. A hard, massive adhesion was at once encountered. It was the size of a large man's thumb and was evidently solid. It was firmly adherent to the pyloric region, and on peeling it away a defect in the wall of the first portion of the duodenum was disclosed. This defect was as large as the thumb-nail, and was not made by the peeling away of the adhesion, which was perfectly smooth and had evidently grown fast to the edges of the intestinal opening. The adhesion was now closely examined and proved to be a small gall-bladder with enormously thickened walls. Possibly a calculus had ulcerated into the bowel months before at this point. The defect in the duodenum was closed with silk sutures after digital exploration had shown the pylorus to be normally patent. The gall-bladder was now extirpated in the usual manner, and the abdomen closed with a single drain to the stump. The walls of the gall-bladder were about half an inch in thickness, and the lumen, completely obliterated at some points, admitted a fine probe at others.

Convalescence was uneventful. For seven days after the operation feeding was exclusively by rectum. Then gradually liquid nourishment was given by mouth, and ten days after operation solid food was first given. The patient was discharged March 7.

CASE XLII.—No. 77,577. *Chronic Cholecystitis; Stenosis of Cystic Duct; Cholecystectomy; Convalescent.*

Mrs. I. E., fifty-six years old, was admitted February 18, 1904. She had had typhoid fever twenty-six years before. During the six years before admission she had suffered about sixteen times with typical biliary colic and had been jaundiced twice.

Gradually the pain, while not extremely severe, became quite constant.

On physical examination the patient stated that there was a tender point one and one-half inches above and to the right of the navel. The liver was clearly palpable below the free costal border.

February 20, cholecystectomy by the usual method. The gall-bladder contained no calculi, and seemed quite normal in appearance, but the cystic duct was so small that only the finest probe would pass. It was slit open almost to its junction with the common duct, and a large-headed probe passed upward into the hepatic and downward through the common into the intestine. Wound closed after a free escape of bile had been noted. Cigarette drain to stump.

Eight days after operation patient was doing well, only a narrow sinus remaining.\*

*Concluding Remarks.*—1. Cholecystectomy, while not absolutely insuring a cure of cholelithiasis, is the most radical procedure at our command.

2. The primary operation is far safer than the secondary.

3. Judging by my own experience in a sufficient number of cases to warrant an opinion, I believe that primary cholecystectomy is, on the whole, an operation at least as safe as appendicectomy.

4. The operation by the method here described is neat, accurate, and thorough.

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- <sup>5</sup> Journal of the American Medical Association, December 1, 1901.
- <sup>6</sup> Loc. cit.
- <sup>7</sup> Medical News, May 2, 1903.
- <sup>8</sup> ANNALS OF SURGERY, 1902.
- <sup>9</sup> Loc. cit., p. 75.
- <sup>10</sup> Medical News, May 2, 1903.
- <sup>11</sup> Medical Record, February 21, 1903.
- <sup>12</sup> Medical Record, May 31, 1902.

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\* June, 1904. Patient made an ideal recovery, and was discharged early in March.

## **PRIMARY SARCOMA OF THE SPLEEN, AND ITS TREATMENT BY SPLENECTOMY.**

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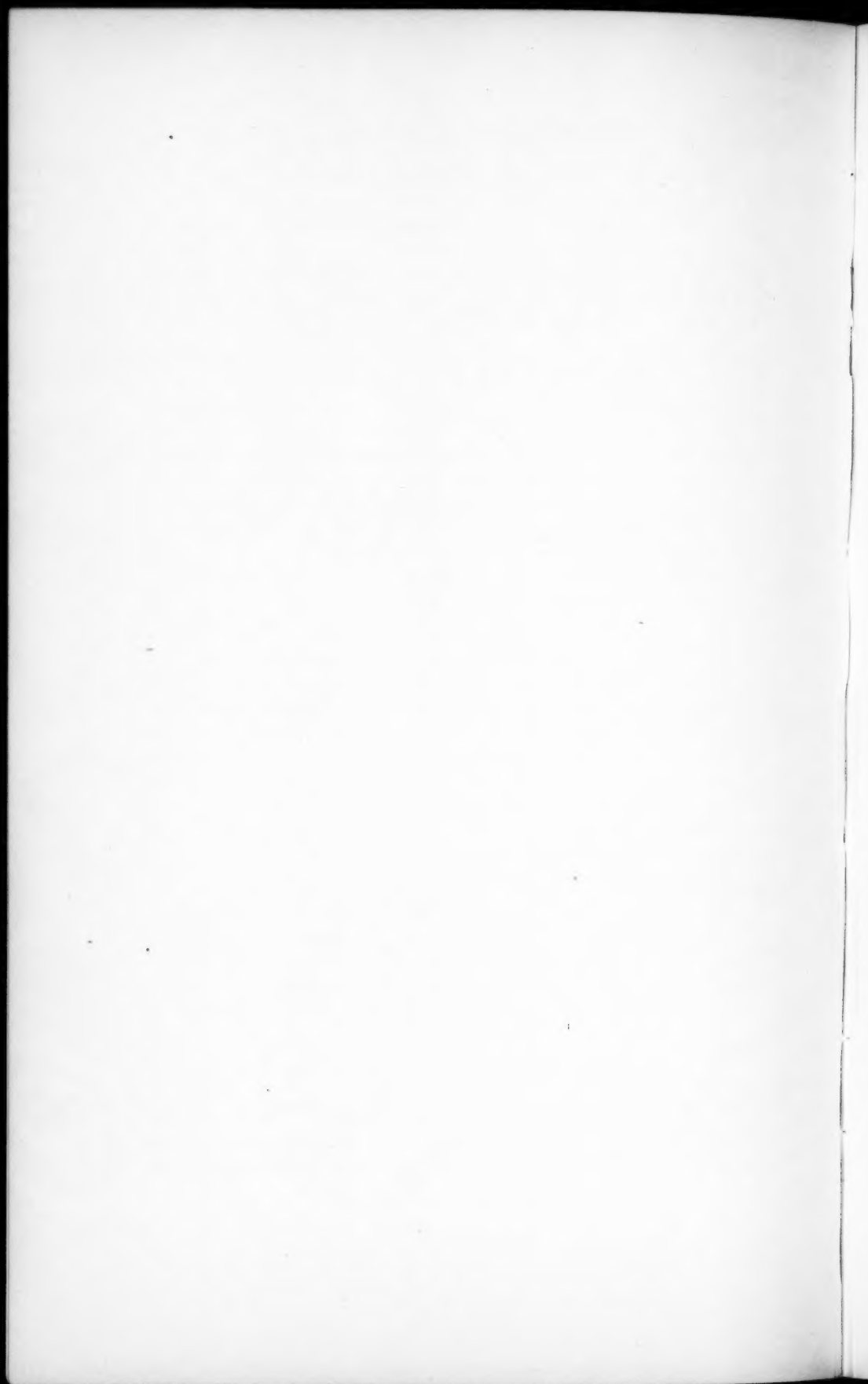
BELIEVING that the advancement in any field of science must result largely from the accumulated experience of the workers in that field, leads us to present the clinical history and pathological findings of a case of fibrosarcoma of the spleen.

Miss O. S., of Kenross, Iowa, entered the University Hospital, May 13, 1903, at the request of her physician, Clarence C. Heald, giving the following history: Age, fifteen years; her family history, as well as her past history, was negative so far as having any bearing upon her present condition. She had never suffered from malaria, any septic process or any injury, that she had any knowledge of. In fact, she had considered herself well until the early manifestations of her present trouble, which consisted in the appearance, about five months previous, of an enlargement in the left hypochondriac region, particularly noticeable upon standing or lying upon her right side. The growth had been gradually increasing in size. It caused her no particular discomfort, aside from a slight dragging sensation after walking about for some time, and the knowledge that there was something wrong as manifested by the presence of the mass which she could feel in the abdomen.

Her general appearance was that of a person possessed of good health and well nourished. Physical examination of the various organs of the economy gave no evidence of the existence of any abnormality, excepting the spleen, which was in question.



A. Section through a portion of spleen and tumor; stained by hematoxylin and eosin. Magnification, 300. 1. Border line between tumor substance and splenic tissue. Section through tumor shows large amount of fibrous connective tissue, also poorly formed blood-vessels and round and spindle cells of the sarcomatous process.





No evidence was obtainable indicating that any organ was performing its functions imperfectly.

Urinalysis negative. The same may also be said as regards the blood examination.

*Physical Examination.*—Inspection of the abdomen, while the patient was lying upon her back, revealed nothing abnormal excepting a slight fulness of the left hypochondriac region. Upon changing her position to the right side, or in standing, the mass was found to descend downward, forward, and inward to the extent that its lower border was about two inches below the umbilicus, seemingly hugging the anterior abdominal wall. The growth, upon the patient assuming the dorsal posture, would recede to the left hypochondriac region. It was not influenced by diaphragmatic movement. Percussion of the colon, with a view to determining its relationship to the growth, when the same was displaced downward, led to some question as to whether the growth was of splenic or renal origin, as the colon was found to pass over the lower part of the growth. Upon palpation, the mass was found to be an elongated one, in the upper half of which the more or less sharply defined edges, indicative of splenic structure, could be fairly well made out; while the lower half of the mass seemed to be more or less lobulated, very dense, and indistinctly merging with the upper portion of the growth. No splenic fissure could be made out. A diagnosis of a solid growth of the spleen was made.

On May 19, 1903, the patient was operated upon through an incision made along the outer border of the left rectus muscle, having its origin an inch below the costal cartilages and terminating about two inches below the level of the umbilicus. This was joined at right angles by another incision about three inches long, running out into the iliocostal space. Before the peritoneum was opened, the purple-colored spleen was already recognized. The spleen was easily brought forward through the wound, and ligation of its pedicle, consisting of the gastro-lienale ligament, in which coursed all the splenic vessels but one, was readily accomplished by double ligation before the spleen was removed. The mesocolon, having been dissected up by the spleen, was opened through its outer border, which was subsequently closed. Owing to the slight oozing from this area, a stab wound in the iliocostal space at the outer border of the kidney was made, into which a

cigarette drain was introduced, which was removed on the second day.

Recovery uneventful. She left the hospital on the twenty-fourth day.

*Present Condition.*—On December 22, 1903, upon request, she presented herself at the hospital and the case was carefully gone over. Her general appearance was that of a person in good health. She expressed herself as having been in perfect health since her return home. Menstruation has been normal the past five months.

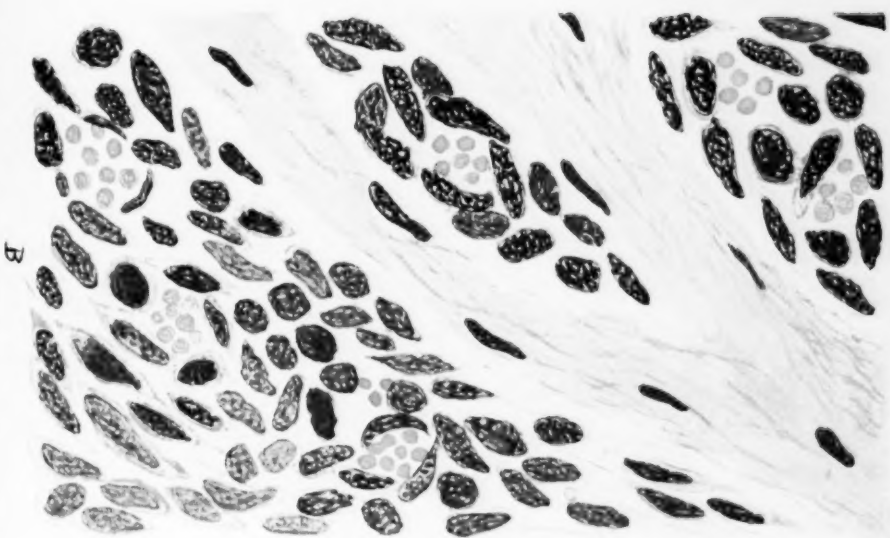
Examination of the various organs was negative. Abdomen palpable without pain or undue rigidity. The region occupied by the spleen, as well as the contiguous structures, were free from induration, the liver seemingly normal.

*Blood Examination.*—A blood examination was made two days prior to the operation and at intervals of two to three days following the operation. The patient was quite anæmic and had a moderate leucocytosis before operation. After the operation, the red corpuscle count fell for several days, then gradually the number increased. A marked leucocytosis was present immediately after the operation, which continued as long as the examinations were made. The amount of hæmoglobin varied in proportion to the number of red corpuscles.

Some poikilocytes, microcytes, macrocytes, and nucleated red corpuscles appeared, especially after the operation.

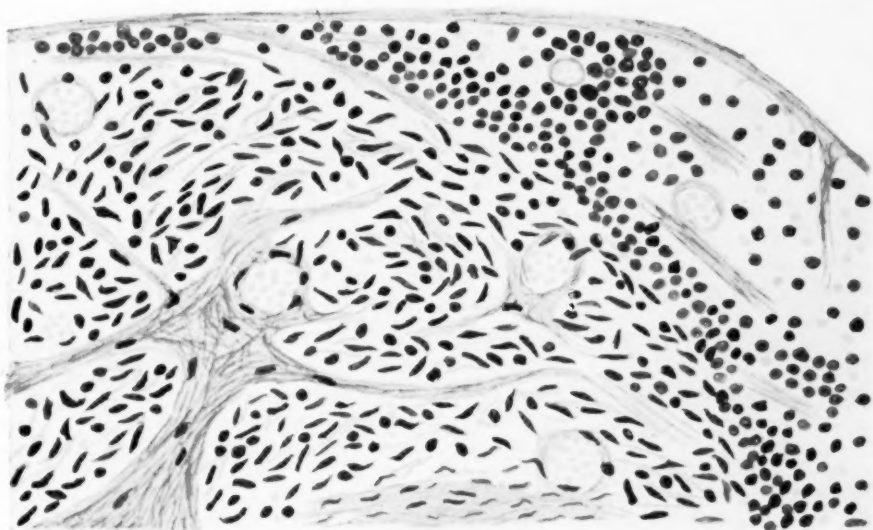
#### BLOOD EXAMINATIONS.

Time of Examination.	Number of Red Corpuscles per Centimetre.	Number of White Corpuscles.	Per Cent. of Hæmoglobin
Two days before operation.....	5,260,000	6,120	72
One day after operation.....	3,346,000	22,200	64
Three days after operation.....	3,116,000	24,500	58
Five days after operation.....	3,320,000	16,200	62
Nine days after operation.....	3,810,000	23,400	62
Thirteen days after operation....	4,360,000	27,000	61
Seventeen days after operation....	4,330,000	24,560	60
Twenty-one days after operation..	4,320,000	23,120	62
Twenty-four days after operation..	4,336,000	23,220	63
December 22, 1903, the seventh month after .....	4,420,000	10,810	84



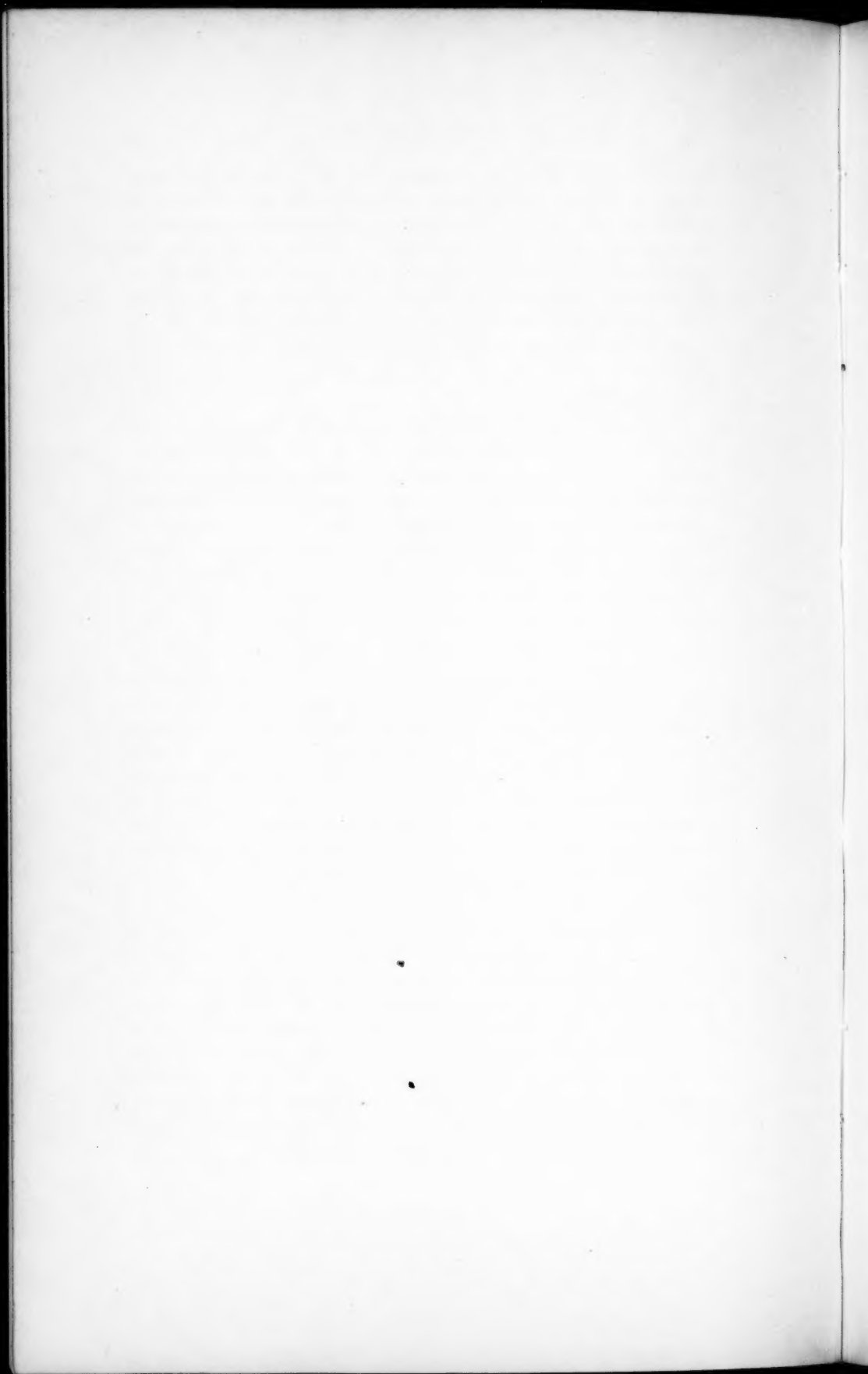
B

B. Section through a portion of the tumor.  $\times 1200$ . Stained by hematoxylin and eosin.



C

C. Section through a portion of spleen and tumor.  $\times 450$ . Stained by Van Gieson's method; connective tissue is stained red. 1. Border line between splenic tissue (above) and tumor substance (below).



The entire specimen, consisting of spleen and tumor mass, is 17.2-4 centimetres long, and varies in width and thickness at different places, as will be described later. It weighs 256 grams, about one-fourth of which represents the weight of the spleen, the remainder the weight of the tumor. The tumor is attached to and apparently occupies the lower portion of the spleen. It is quite well encapsulated. The capsule of the tumor and the line of demarcation between the spleen and tumor are not easily distinguishable, so that the tumor mass appears to be continuous with the splenic substance.

The tumor is rather spherical in general outline and has a circumference of  $23\frac{1}{2}$  centimetres. The surface of the tumor presents a rather nodular appearance, which is most marked along the lower and external surfaces. The mass is quite hard and firm, considerably more so than the spleen, and is of a dark purple red color, a color practically the same as that of the external surface of the spleen.

The specimen was cut in such a way that the incision extended along the middle of the external or phrenic surface of the spleen, and then continued through the tumor mass. The cut surface of the tumor area is of a bright red color, quite uniform over the entire surface, but here and there are found dense bands of tissue of a white color with a slight tinge of blue. The dense bands are at certain places four millimetres wide, at other places they appear as delicate threads. Some of them appear to be sharply defined from the surrounding red-colored tissue; others seem to diffuse gradually into the surrounding substance. The dense fibrous tissue is rather irregularly distributed, and it is the contraction of this tissue that accounts for the place on the external surface which produced a depression about one centimetre deep. The upper portion of the tumor fits into a concavity made by the base of the spleen. The upper border of the tumor is readily recognized and easily distinguished from the splenic substance by the bright red color of the former as compared with the yellowish brown color of the latter. At one place, however, the border line is not so readily noted. It appears as if there has been a slight interchange of splenic and tumor substance. Although apparently well circumscribed, a distinct connective-tissue capsule is recognizable only at the periphery, where a small strip which is connected with the capsule covering the spleen and tumor externally extends in-

ward between the spleen and tumor for about one-half centimetre on all sides. The tumor is nine and three-fourths centimetres long, eight and one-fourth centimetres wide, and seven and three-fourths centimetres thick.

The spleen itself appears to be but little affected. It has a pyramidal form, the base in contact with the tumor. The base is, however, not represented by a flat surface, but has considerable of a concavity which lodges the upper portion of the tumor mass. At the base the spleen is seven centimetres wide and four centimetres thick. The apex comes to a quite sharp point. The external or phrenic surface presents a normal convexity and is seven centimetres long. The intermediate ridge separating the gastric from the renal surfaces is quite well marked and is seven centimetres in length. The gastric surface is flat and only three and one-half centimetres wide at the base. The anterior margin is eleven centimetres long and contains no notches. The posterior border is more blunt and is only eight centimetres long. The hilum is located on the gastric surface, beginning six and one-half centimetres below the apex of the spleen, at first adjacent to the intermediate ridge, then extending outward and downward towards the anterior border, terminating at a point between the spleen and the tumor, two centimetres from the anterior border of the spleen. The ligaments constituting the pedicle of the spleen have an attachment extending from above the hilum downward, covering the internal surface of the tumor for two and one-fourth centimetres. The vessels passing into and coming from the organ enter the spleen directly through the hilum, with the exception of two, which enter the substance of the tumor. The spleen has a normal, dark purplish-red color and is normal in consistency.

The size of the spleen as compared with the size of the patient seems to indicate that there has been but little, if any, destruction of splenic substance.

On microscopic examination it is found that different portions of the tumor present different conditions. In most places there is found a dense field of cells, some of which are round, but the majority are spindle shaped. Most of the cells have a large nucleus rich in chromatin and surrounded by a small amount of cytoplasm, in others the cytoplasm is large in amount. Between some of the cells there is found the distinct elements of fibrous connective tissue. The dense white areas noted above

are made up of an almost homogeneous fibrillar connective tissue containing only a few nuclei.

The blood-vessels of the tumor are very poorly formed, most of them lined simply by endothelial cells or by the tumor cells themselves. In certain places, a number of red corpuscles are seen lying free between the tumor cells. A section through the specimen at the place where the tumor borders on the splenic substance reveals the absence of a distinct capsule. The border-line between the two structures can, however, be fairly well determined. The splenic tissue lying adjacent to the tumor substance consists of normal splenic elements very closely crowded together, even more so than are the cells of the Malpighian corpuscles. In this dense splenic tissue, which is from one-fourth to one-half centimetre wide, no blood-vessels were found, and only here and there an occasional red corpuscle, so that this tissue can really be considered as a limiting membrane, preventing any rapid spread of the tumor into the substance of the spleen proper. The splenic tissue elsewhere appears to be normal.

That the spleen is not an organ essential to the maintenance of a fair degree of health has had abundant proof through the numerous splenectomies of the past half-century. Thus, of the 274 cases of extirpation of the spleen which it was possible for Van Verts to report in 1897, 170 recovered, while the 360 cases collected by Hagan in 1900 give a mortality of only 38.3 per cent.; and we have no doubt that were statistics obtainable to the present time, an equally good, if not a much better, showing could be made. The result is that the spleen is being rapidly forced into that large list of organs which are being subjected to operative procedure on the part of surgeons. Of these procedures, splenectomy has won for itself a fixed place, and must henceforth be looked upon as a rational means of treatment in certain pathologic conditions of the spleen. Yet, when we come to a consideration of what these conditions are which shall form such indication, we realize that much remains to be done in this direction, and in no particular class of cases is this more evident than in the treatment of neoplasms of this organ. The paucity of accumu-



lated experience of the profession may be considered as responsible for this to a large extent.

It has long been recognized as a fact that the spleen is possessed of a relative immunity to secondary involvement by new growths, while the existence of malignant neoplasms having their origin primarily in this organ has been so infrequently observed that some doubt has been expressed as to their existence. Litten, in Nothnagel's Series, Vol. viii, 1898, states that "Primary sarcoma of the spleen is very rare." Mosler, in his work upon "Diseases of the Spleen," in 1875, knew of no case, and B. Grohe, in "Virchow's *Archives*," in 1897, writes as follows: "Tumors of the spleen recognizable during health occur very seldom. Of heteroplastic tumors of the spleen, only a few cases are known. Primary sarcoma appears more than doubtful, while primary sarcoma of the spleen is extremely rare."

Weichselbaum was the first to report any cases of primary sarcoma, if we exclude the case reported by Friedreich in 1865, under the title of "Multiple Nodular Hyperplasia of the Liver and Spleen," which Bunting, however, believes to have been a primary sarcoma of the spleen. Weichselbaum (Virchow's *Archives*, 1881) states that until that time there existed no records of any cases in medical literature. He then proceeds to report two cases. Since that time there may be found scattered through medical literature reports of a fair number of cases, which have been recorded as primary malignant neoplasms of the spleen. We herewith append a list of those so far recorded. The total number which we have been able to gather from various sources is thirty-two, including the one here reported. It will be understood that much doubt must exist as to whether all of the cases included in this number rightfully belong there, as some of the cases were recorded as such without having their true nature determined by careful microscopic examination of the specimen. And in some of the cases the clinical history and gross findings are at variance with our present conception of primary neoplasms, as will be pointed out later in dealing with the operative cases.



Sarcoma of spleen, gross specimen.



Of the above thirty-two cases, twelve were subjected to operative interference, eleven to splenectomy, and one to enucleation of the growth. The latter case was that of Heinrichius, in which instance there no doubt existed a pedunculated primary fibrosarcoma of the spleen, developing from its capsule, which at the time of the operation was looked upon as a benign growth, and was consequently subjected to enucleation, with the result that probably a portion of the growth remained through which recurrence took place. It was only after a microscopic examination of the growth was made that it was found to be a fibrosarcoma with myxomatous degeneration. Heinrichius expresses himself as follows regarding this case: "Had I known at the time of the operation that the growth was malignant, it would have been more proper to have extirpated the spleen, although the organ itself appeared, and evidently at the time was, normal." Case died seven days after the operation.

Of the eleven splenectomies, three died following the operation, namely, the cases of Flothmann, Collins, and Krylow.

The case of Flothmann was that of a man aged forty-four years, cachectic, possessed of a four-pound splenic growth, which was adherent upon all sides to adjacent structure. At the termination of the operation there was observed in the omentum the existence of a tumor about the size of a man's fist. Its removal was also undertaken. Death followed fifty hours later from acute anæmia. The spleen was studded throughout with innumerable small growths, some as large as a hazel-nut. As this case presents a picture somewhat typical of metastasis to the spleen, it is believed there exists some reason for excluding it from among primary sarcomas of the spleen.

The case of Collins was that of a male, aged thirty-six years, who had suffered severely from malaria ten years previously while a soldier in the English army in India, since which he had, however, been apparently well until two months prior to the operation, at which time he noticed a growth in the left side, which was increasing in size and at times was painful. He had lost fifteen pounds in weight in these months. No other symptoms existed. Blood examination revealed white corpuscles, 5000; hæmoglobin, 60 per cent. At the operation, January 11, 1900, the spleen was found to be extensively adherent to surrounding structures. A portion of the pancreas was removed with the growth. A portion of the spleen not affected by the growth was allowed to remain attached to the

cardiac end of the stomach. Death followed on the sixth day, due to acute general peritonitis, pleuritis, and streptococcus septicaemia. Growth consisted of a small round-cell sarcoma about the size of two fists, and a sarcomatous mass size of palm of hand, with some pancreatic tissue and a small supernumerary spleen about the size of a walnut.

In the case of Krylow, which we quote from Simon, he having quoted the same from Hildebrand's *Jahresberichte*. "Splenectomy was undertaken in a patient fifty-one years old, much emaciated. Much hæmorrhage resulted from the operation, the patient dying four hours later. The tumor was reported to be a sarcoma, weighing eight and one-half pounds, which had existed for three years." The remaining eight cases which recovered from the immediate effects of the operation are as follows:

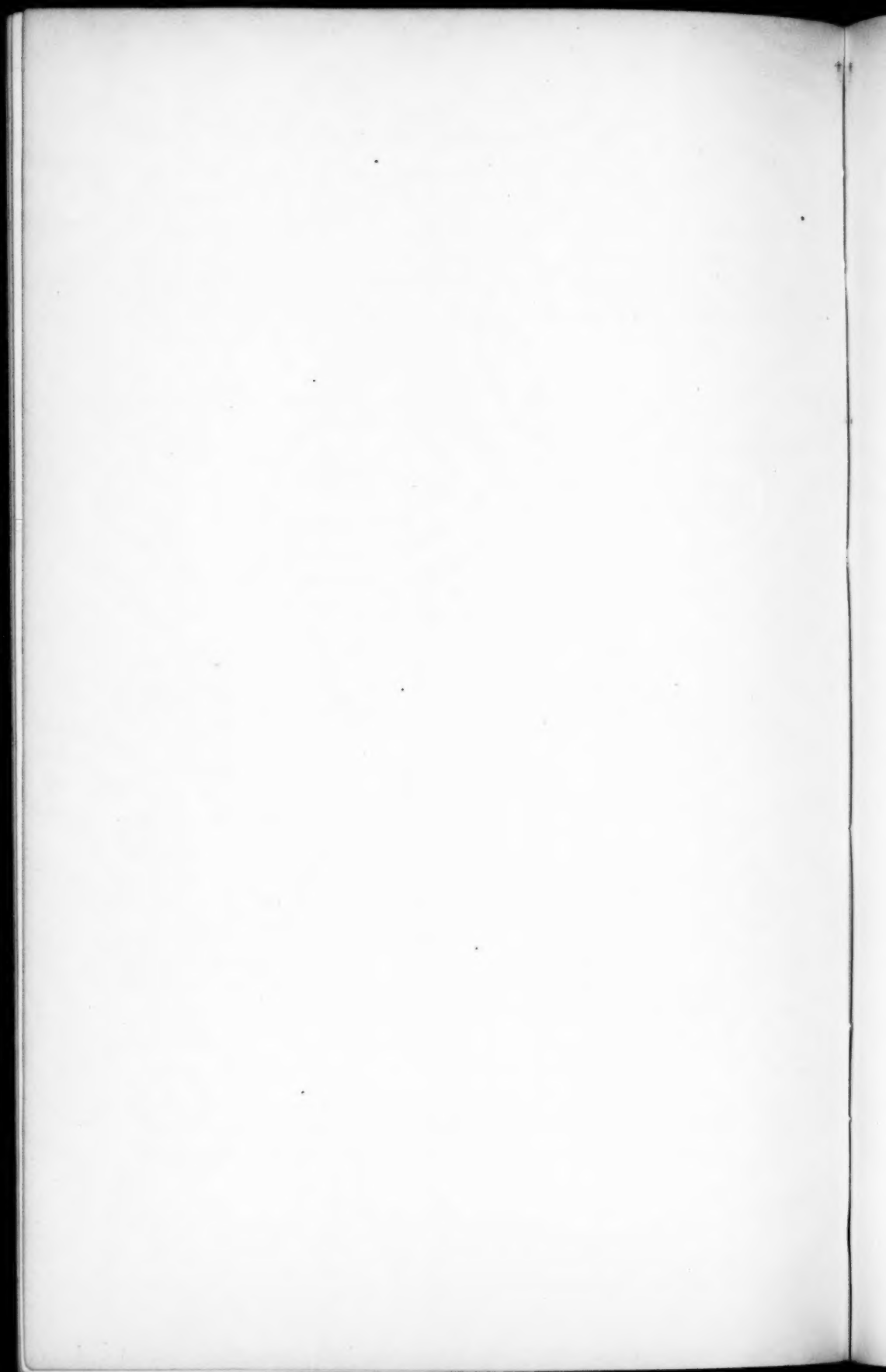
Case of Billroth (reported by Von Hacker). Patient, female, aged forty-three years. Tumor and spleen of large size, weighing 1450 grams. Tumor was smooth in front, but possessed of a protuberance posteriorly. Lower border divided by three fissures. The tumor was quite painful on pressure, which pain was reflected to left shoulder. The same was diagnosed by Billroth prior to operation as a sarcoma. The spleen was removed; it being the first case of splenectomy for sarcoma. The tail of the pancreas was found adherent to the tumor growth, seven centimetres of which were removed. The tumor was seventy-five centimetres in circumference, twenty-five centimetres in length, and eighteen centimetres in width. Microscopic examination showed it to be a lymphosarcoma. The growth had probably existed over ten years, as for that length of time at least there had been observed a marked fullness in the upper left quadrant of the abdomen, and for seven years there had existed two growths of a size sufficient to be palpable. The last two years were marked by rapidly increasing growth. Three weeks subsequent to the operation there existed a slight leucocytosis. The patient died six months later from recurrence.

Jordan's case was that of a patient, fifteen years of age, who in June, 1895, was subjected to an operation by him for the removal of an enlarged lymph node about the size of an egg, from the submaxillary region of the left side, which microscopic examination seemed to indicate as being a lymphosarcoma. Some time later the patient began suffering very severely from pain in the splenic region, and in August, 1896, the spleen was removed. It was found to be the seat of a sarcoma with metastases in the structure of the hilum. The patient is supposed to have died of recurrence. May it not be that this case should be expunged from the list of primary sarcomas of the spleen, owing to the fact that it may have been secondary to the sarcomatous lymph node previously removed?

In the case operated upon by Professor Kocher, no definite history is possessed as regards the case, excepting that the spleen was the seat of a lymphosarcoma with many regional metastases involving the liver and mesenteric lymph nodes. It was considered by Vulpius, Braun, Litton, and



Sarcoma of spleen, gross specimen. Section through tumor.





others as a primary sarcoma of the spleen. Simon, however, has raised the question as to whether the patient did not suffer from a generalized lymphosarcoma, in which process the spleen became secondarily involved.

As regards the case of Herczel, we again quote from Simon, who quotes the same from Hildebrand's *Jahresberichte*.

The case was that of a fourteen-year-old boy, in which a growth had been noticed for one week. The extirpated spleen measured twenty-five by nineteen centimetres, and weighed 2456 grains. Within the otherwise perfectly normal spleen, there existed what was considered a primary sarcoma of the spleen about the size of an apple. Following the operation there existed a marked leucocytosis, the patient recovering, but as regards subsequent history nothing is known.

The case of Fritch was that of a woman aged thirty-one years, multipara, who had since March, 1887, suffered with severe pain in the region of the spleen, at which time a small tumor had also been observed in the hypochondriac region, which grew rapidly until June 24, 1887, at which time she was operated upon. Blood examination in this case was normal. The recovery was uneventful, and on the 24th of November the following year she gave birth to a still-born child. The woman died six and one-half years later of what was presumed to have been a cardiac lesion. No post-mortem was obtainable. The spleen was seemingly normal, excepting at one point upon its convex surface, where existed the growth in the splenic structure, which upon section seemed to be well circumscribed, although not sharply so, from splenic structure.

Wagner's case was that of a woman aged twenty-seven years, multipara, last confinement, which was followed by normal puerperium of two weeks' duration, preceded the operation by seven weeks. The growth, which was readily movable, and about the size of a child's head, was first noticed after her getting up from her confinement. The palpable surface of the tumor seemed more or less smooth, of about the consistency of the liver. Microscopic examination of the blood showed a normal relationship between the reds and whites and the normal quantity. The patient was operated upon November 30, 1893. Recovery uneventful. In April, 1894, her condition was excellent. Van Verts reports her in 1897, which is three years later, as in good condition. The spleen and tumor weighed 1285 grams, and measured  $19 \times 9\frac{1}{2} \times 10$  centimetres.

Garre's case, reported by Simon, was that of a woman thirty-eight years of age, iv para, who since her first confinement, eleven years previously, had suffered some distress in the gastric region. When about five months advanced in last pregnancy, she began to suffer much from pains in left hypochondriac region, which, however, subsided in the course of a short time. Normal confinement. In about five months there was a recurrence of the pain in the left hypochondriac region, though not severe.

The general condition of the patient at this time was that of one being in fair health. Urine normal. Blood; reds, 4,310,000; whites, 5000 per centimetre. Growth felt in left hypochondriac region. Diagnosed as sarcoma of spleen. Splenectomy. Recovery uneventful. Blood count, post-operative: second day, reds, 2,350,000; whites, 8600. Seventh day, reds, 3,600,000; whites, 7800. Thirtieth day, reds, 4,100,000; whites, 7000. A hæmoglobin, 50 and 60 per cent. Spleen measured  $22 \times 13.5 \times 11$  centimetres, and weighed 1750 grams. Microscopically, growth shown to be a round-celled sarcoma. Reported free from recurrence at the end of four months.

Of the eight cases that survived the immediate effects of the extirpation of the spleen, three cases have died of recurrence (Billroth, Jordan, and Kocher), and regarding one (that of Herczel) there exists no data which can be utilized in determining freedom from recurrence. Of the four remaining, two at least may be said to have been free from recurrence, namely, the case of Fritch, living six and one-half years, and Wagner's case being well at the end of four years. In the remaining two cases, namely, Garre's and the one here reported, it cannot be said that a sufficient time has elapsed since the operations to eliminate the possibility of recurrence; yet, the fact that the first was, after careful examination at the end of four months and the latter at the end of ten months, found to be possessed of good health, without any discernible evidence of recurrence, entitles one to the belief that freedom from recurrence may be the result. If this be true, primary sarcoma of the spleen may be looked upon as highly amenable to a cure through splenectomy, for, from the foregoing list of cases operated upon, we should, in trying to determine the amenability of the spleen to operative interference, in the case of malignant growths, exclude all cases where the same have given rise to metastasis or is under the suspicion of having been secondarily involved. Such would be a contra-indication in any organ or tissue of the body. The three cases in which recurrence took place fall in this class.

It is quite possible that future experience may show that it will be necessary to further take into consideration, when determining the amenability of the sarcomatous spleen to

extirpation, the tissues from which the same arises. Thus the spleen offers three types of connective tissue from which it may originate. First, the capsule and trabecula; second, lymphoid structure, and, third, the endothelial cells, which give rise respectively to the fibrosarcomata, lymphosarcomata, and endothelialsarcoma.

*Diagnosis.*—A diagnosis at an early stage, before the occurrence of metastases, is of course an essential in the treatment of malignant growths here as elsewhere in the economy.

The early recognition of malignant growths of the spleen presents some real difficulties, on account of the meagre symptoms, which result from its presence. We could only expect the presence of three symptoms, namely, 1. Enlargement of the spleen. 2. Pain. 3. Blood changes.

1. The first symptom, namely, enlargement, must be difficult of recognition in the early stage, owing to the protected position of the spleen making palpation impossible, while percussion is not to be relied upon. Owing to the only moderate support which the spleen has through the reflections of the peritoneum, it seems that the increased weight soon lengthens these attachments, with the result that the spleen at an early period acquires a range of mobility making it possible for it to descend below the costal margin, where it may become palpable, thus giving us the most trustworthy evidence possible of attainment in the light of our present knowledge of the subject. It having been determined that the growth pertains to the spleen, the nature of the enlargement will present itself for solution. The physical characteristics of the growth will largely aid in this. Thus, if the spleen is uniformly enlarged, with its normal shape well maintained, it would be a justification for excluding all primary neoplasms, at least in the early stage of their formation. While if, on the other hand, the spleen is not uniformly enlarged, but the seat of nodosities, or localized enlargement, it would bring up for review those various conditions capable of bringing this about. If it is possible to determine by palpation or aspiration (this latter means of diagnosis is probably not so safe as that of explora-

tion in capable hands) that the enlargement is cystic, then, of course, there is excluded echinococcus and other cysts as well as abscess of the spleen. The growth being a solid one, the question of its being a sarcoma, fibroma, angioma, or lymphangioma appears for solution; and this must certainly be at times quite impossible until the growth is exposed to inspection by an exploratory incision; although, in the instance of Billroth and Garre's, it is said that a diagnosis was made prior to operation. Theoretically, we would expect rapid growth, yet a review of the cases does not show this to be always so. This phenomenon has had much stress laid upon it as a symptom by Ledderhose, Litten, Braun, Krause, and others; but it must often fail in being of real value, owing to the fact that it must be very difficult to determine this in many instances; and if malignancy is suspected, it would seem unwarrantable to defer treatment until the rapidity of growth could be definitely determined.

2. Pain. Considerable pain would be expected to exist, owing to the distention of the splenic capsule; yet this does not seem to be a symptom of much value, as it is often absent, and if present, a misinterpretation of its significance must often occur, owing to the proximity of this organ to the stomach and left kidney.

3. Blood examination seems to be of no real value from a diagnostic stand-point as revealed by the results of those undertaken in the cases so far reported.

An analysis of the symptomatology of primary sarcoma leads to the belief that the diagnosis must, for the present at least, be largely based upon the recognition of the existence of a solid growth in the spleen, and that a definite diagnosis cannot be made until the spleen is exposed through an exploratory incision, which, it seems to us, would always be indicated where doubts exist.

Treatment. As to treatment, no question can exist as to the advisability, in the absence of secondary involvement of other organs, of removing the spleen, which in the hands of the experienced surgeon must be associated with but a small

mortality; and it is believed that the results of the work so far undertaken are such as to justify the hope that a very large per cent. of primary sarcomas of the spleen will be proven susceptible of a radical cure.

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## CASES REPORTED AS PRIMARY SARCOMA OF SPLEEN.

No.	Age.	Sex.	Reported by	Spleen.	Other Organs.	Symptom.	Classification of Growth.
1	56	M.	Friedreich, 1865.	Post-mortem specimen. Spleen seat of many small tumors, varying in size from those being just visible to the size of a pea.	Liver was involved by similar growths.	.....	Primary endothelial sarcoma of spleen. So classified by Bunting.
2	21	M.	Weichselbaum, 1881.	Spleen much enlarged, with nodular growths throughout its structure.	.....	.....	Primary endothelial sarcoma. Birch-Hirschfeld classed it among the nodular hyperplasias.
3	21	M.	Weichselbaum.	Tumor arose in substance of spleen, from which it was easily separable, and projected above the convex surface. About one 24 by 10 by 17. About one quarter of which appeared normal, the remainder being of a uniform grayish color.	No metastasis.	.....	Primary fibrosarcoma.
4	55	F.	J. Weber, 1901.	.....	Metastasis in mesentery, omentum, and retroperitoneal lymph-nodes.	.....	Lymphosarcoma.
5	39	M.	Schönstadt, 1891.	.....	No metastasis.	.....	A mixed tumor partly of the nature of a fibroma and partly endothelioma. Lymphosarcoma. Birch-Hirschfeld believes it to have been a large hyperplasia.
6	20	M.	Grohe, 1897.	28 by 13 by 18 centimetres. Permeated throughout by nodular growths, but small amount of splenic pulp.	It was adhered to diaphragm, stomach, and left lobe of liver.	History of a previous fall followed by pain in left side. Haemoglobin 70 per cent. Reds 4,600,000; whites 15,400. Had been incapacitated for labor before death by reason of pain and discomfort for a period of only sixteen days.	Primary round-celled sarcoma.
7	49	M.	Bunting, 1903.	Spleen enlarged, weighing 250 grammes. Bulk of organ appears to be made up of grayish opaque tissue.	Metastasis to liver, pancreas, gastrophagic lymph-nodes, and subcutaneous tissue.	.....	Primary endothelial sarcoma.
8	54	F.	Casott.	.....	Metastasis throughout the abdomen.	.....	Primary round-celled sarcoma.
9	28	F.	Woodruff.	Pencilated tumor arising from the spleen.	Metastasis liver, gall-bladder, and descending colon.	Patient had previously suffered from malaria.	Primary lymphosarcoma.
10	13	M.	Baccelli, 1876.	Weight of spleen, 200 grammes.	.....	.....	Primary lymphosarcoma.
11	.....	.....	Trelat.	.....	.....	.....	.....
12	.....	.....	Picon.	.....	.....	.....	.....
13	.....	.....	Ramond.	.....	.....	.....	.....
14	.....	.....	Boyard.	.....	.....	.....	.....
15	.....	.....	Moslier.	.....	.....	.....	.....
16	.....	.....	Parker.	.....	.....	.....	.....
17	.....	.....	Perry.	.....	.....	.....	.....
18	.....	.....	Bridges.	.....	.....	.....	.....
19	.....	.....	Clark.*	.....	.....	.....	.....
20	5	M.	Note.	.....	.....	.....	.....

\* A case reported by Clark as a congenital small round-celled sarcoma of abdomen, including in its growth the spleen and left testicle, and filling whole left side of abdomen, should probably be excluded, as origin of tumor was not definitely ascertained.

## CASES REPORTED AS CARCINOMA OF SPLEEN.

With metastasis in liver and peritoneal cavity. As microscopic examination was made only in the last two, they should probably be classified either among the sarcomas or splenic anemias.

Case considered by Litten as a sarcoma of the kidney.



## CASES SUBJECTED TO OPERATION.

No.	Age.	Sex.	Reported by	Splenectomy	Result.	Spleen.	Other Organs.	Symptom.	Classification of Growth.
21	....	....	Heinricius.	Enucleated growth by Heinricius.	Death seventh day.	Pedunculated fibrosarcoma arising from spleen. Weight, 500 grams.	No metastasis.	None except as manifested through presence of growth.	Primary fibrosarcoma.
22	54	M.	Flothmann.	Splenectomy.	Death fifty hours after the operation from symptoms of acute anæmia.	Splenic tumor weighed four pounds and permeated by innumerable small growths, largest size of hazel-nut.	Extensive adhesions. Growth size of fist in omentum.	Not given.	Primary lymphosarcoma.
23	51	....	Krylow.	Splenectomy by Krylow.	Death followed four hours after operation from acute anæmia.	Spleen and tumor weighed eight and a half pounds.	Extensive adhesions, involving pancreas and stomach.	None except presence of growth.	Primary small round-celled sarcoma.
24	36	M.	Warren, 1901.	Splenectomy by J. C. Warren. A portion of spleen left attached to stomach. Part of pancreas removed.	Death sixth day after operation of general peritonitis, pleuritis, and streptococcus septicæmia.	Size of growth that of two fists.	Extensive adhesions to pancreas and stomach.	No symptoms except presence of growth in left hypochondriac region, and loss of weight.	Primary small round-celled sarcoma.
25	43	F.	Von Hacker.	Splenectomy by Billroth.	Recovery. Died six months later from recurrence.	Spleen and growth weighed 1450 grams and measured 25 by 18 centimetres.	No adhesions on convex surface. Omentum and loops of intestine adherent at concave surface. Four centimetres of spleen removed with growth.	For seven years had noticed growth size of two fists in left hypochondriac region. Rapid growth last two years. Marked pain.	Primary lymphosarcoma.
26	....	....	Kocher.	Splenectomy by Kocher.	Recovery. Subsequent death from recurrence.	Spleen uniformly enlarged.	Metastasis liver and mesenteric lymph-nodes.	.....	Primary lymphosarcoma.

27	15	.....	Jordan.	Splenectomy by Jordan.	Recovery and subsequent death by recurrence.	Sarcomatous growth in spleen metastasized into hilum.	Fourteen months previous to splenectomy an enlarged maxillary lymph-node removed, which was a lymphosarcoma.	Pain in splenic region and enlargement in same region	Primary sarcoma.
28	14	M.	Herczel.	Splenectomy by Herczel.	Recovery. Subsequent history not.	Spleen and growth weighed 2450 grams and measured 26 by 19 centimetres. Sarcomatous growth structure size of apple.	No metastasis.	Presence of growth recognized only one week before the operation. No other symptoms recorded.	Primary rounded-celled sarcoma.
29	29	F.	Wagner, 1894.	Splenectomy.	Recovery. No recurrence.	Weight, 1285 grams. Size, 19 by 9½ by 10 centimetres.	No adhesion and no metastasis.	Seven weeks after last confinement, which was normal, noticed growth in left hypochondriac region. No discomfort from it. Blood count normal.	Primary endothelial sarcoma. Bunting. Rounded-celled sarcoma, Marchand.
30	31	F.	Fritch, reported by Asch.	Splenectomy by Fritch.	Recovery uneventful. Normal confinement eight months after operation. Died six and a half years after operation of cardiac lesion.	Weight of spleen and growth, 2 grams. Size, 22 by 14 by 10 centimetres.	No adhesion and no metastasis.	Severe pain for three or four months prior to operation. Pregnant five weeks. Tumor in left hypochondriac.	Primary lymphosarcoma.
31	37	F.	Simon.	Splenectomy by Garré.	Recovery. Condition of patient good at end of one year.	Spleen and growth weighed 1750 grams and measured 22 by 13.5 by 11 centimetres.	No adhesion and no metastasis.	None except some pain and the persistence of the growth. Duration of growth not given.	Primary rounded-celled sarcoma.
32	15	F.	Jepson and Albert.	Splenectomy by Jepson.	Recovery. Condition of patient good at end of ten months.	Spleen and tumor weighed 256 grams. Tumor weighed 190 grams and measured 9½ by 8½ by 7½ centimetres.	No adhesion and no metastasis.	None except those of presence of growth, which was recognized five months prior to operation.	Primary fibrosarcoma.

## HERNIA OF THE UTERUS THROUGH THE INGUINAL CANAL.<sup>1</sup>

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THE following is the report of a case of inguinal hernia of the uterus, with operation and recovery.

H. B., colored, aged twenty-seven years, occupation, housewife; married nine years; has had three children (all living), now aged eight, seven, and three years. No miscarriages; menstruation normal. Patient has had a small, right inguinal hernia as long as she can remember. This was about the size of a walnut, a small, hard, painless protrusion, which always descended when she was upon her feet and disappeared on lying down. It never was observed to be irreducible, and gave her no trouble. A truss had been recommended, but she had never worn one.

On January 20, 1904, one week before admission to the hospital, and while occupied in washing clothes, but not, according to her account, making any especially severe exertion, a large protrusion, much larger than ever before observed, made its appearance in the right groin. Its development was accompanied by severe pain in that region, forcing her to lie down. She remained in bed, the pain becoming more severe. She had neither vomiting nor constipation, and was not aware of the presence of fever, and had no chill.

She was seen by Dr. J. H. Cloud, who sent her to the Bryn Mawr Hospital on January 27, 1904. She was in excellent condition at that time. Examination showed a swelling, half the size of the fist, in the right inguinolabial region, coming from the external abdominal ring; hard, irreducible, somewhat tender, evidently an irreducible, complete, inguinal hernia. The absence of symptoms of obstruction, with her history, made probable the

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<sup>1</sup> Read before the Philadelphia Academy of Surgery, March 7, 1904.

diagnosis of omental hernia,—epiplocele. Operation was advised, and consented to, and the patient was admitted about noon of the same day. The temperature on admission was 98.2-5° F., her pulse and respiration normal. In the evening the temperature was 100° F. Dr. Walter Christie, the physician on duty, also examined her, and concurred in the advisability of operation.

Operation, January 28, Dr. Christie assisting. Under anæsthesia the hernia was again examined and found to be irreducible. No prolonged taxis was attempted. An oblique incision over the neck of the tumor showed it to be pear-shaped, the wider end presenting, the sac adherent at the fundus or peripheral portion, and free at the constricted base. The sac was opened at the latter point and peeled away. The examination of the contents was at first confusing, although we were still under the impression that the bulk of the mass was omentum. While endeavoring to unfold it, it suddenly split longitudinally, and about three-quarters of an ounce of yellow, odorless pus escaped from its interior. This was quickly sponged away, and an ovary was then seen to be protruding from the inguinal canal to the right side of the neck of the mass, and what had been supposed to be a large intestine flattened out by pressure, was found to be the broad ligament and Fallopian tube of the right side. It was then discovered that the herniated mass was the uterus turned over forward, the supravaginal portion running backward, downward, and inward towards the cervix. A vaginal examination determined the continuity of the cervix with the mass, and the examining finger was easily felt through the upper vaginal wall immediately in front of it. The necrotic and infected condition of the body of the uterus forbade its reduction, and it was decided to remove it with the right ovary, which was now prolapsed through the external ring. This was done, after applying a series of silk ligatures to the broad ligaments, tubes, and supravaginal portion of the uterus, which formed the pedicle, and the adherent sac was also cut away. The presence of pus in the cavity of the uterus rendered infection of the wound possible, and it was not deemed advisable to drop back the stump or to open up the inguinal canal and perform the Bassini operation as we had intended. To secure drainage from the possibly infected stump, to exclude it from the peritoneum, and to close, as far as possible, the canal, we decided to fasten the pedicle in the external abdominal ring, and closely sutured the pillars of

the latter with chromicized catgut above, around, and below it. A small gauze wick was then laid over the stump, and the wound closed in its deeper portion by a continuous chromicized gut suture, and the skin with silkworm gut, the gauze being brought out at the lower angle.

After operation the patient's condition was excellent. The temperature in the evening was  $98\ 3\text{--}5^{\circ}$  F., the pulse 92. The following day, the 29th, a bloody vaginal discharge appeared. The highest temperature recorded after operation was on the evening of the 29th,  $100\ 1\text{--}5^{\circ}$  F., the pulse 80. The wound was dressed on the 30th, and when the gauze wick was removed, a small quantity of bloody mucus followed it, and again on February 1, when a small rubber tube was inserted instead of the gauze, to drain away the mucus discharging from the stump. This was removed two days later, and the wound quickly healed without infection, being solid, and the stitches removed on the tenth day. The vaginal discharge lessened and disappeared in a few days after operation. The patient complained of some pain across the lower portion of the abdomen after the wound was healed, but this soon disappeared. Menstruation appeared on February 25, was profuse, as usual, and lasted four or five days, with the usual slight pain in the hypogastric region. The patient was allowed to get up after four weeks, and suffered no further inconvenience. An examination made February 29 showed the wound solidly healed, no hernia or unusual impulse on coughing on that side, the stump of the uterus easily palpable by bimanual examination and slightly movable, upward and downward, the cervix being tilted somewhat downward.

Sections through the body of the uterus were made by Dr. W. Bradford Eaton, Pathologist to the Hospital, who very kindly furnished me the following report:

"The section studied was taken from the uterine wall, bordering the large abscess ruptured at time of operation (uterine cavity). The wall was of average thickness, and showed direct evidence of pyogenic infection. The sinuses in places were densely infiltrated with polymorphonuclear leucocytes, and scattered through the specimen were many foci of densely crowded pus-cells. The part of the specimen bordering upon the abscess showed what at first seemed to be a remnant of placental tissue, but which further study showed to be particles of blood-clot that were held by the necrotic

remnants of the endometrium. Here and there could be seen remains of mucous glands and occasional strips of degenerated uterine mucosa. The condition corresponded to that found in intense hæmorrhagic and pyogenic infection, such as was apparently present in this case."

The persistence of menstruation is explained by the fact that the amputation was done some little distance above the internal os, and the left ovary was not removed, although its tube was, of course, tied off with the pedicle. It was not drawn out or observed during the operation.

While the presence of an ovary in the sac of an inguinal hernia is not very uncommon, most operators of large experience having encountered it one or more times, the presence of the uterus is one of the rarest phenomena of hernia. But while of great rarity, its occurrence has not escaped the attention of some of those who have made a special study of hernia and of affections of the female genitalia, and cases of umbilical, ventral, inguinal, crural, and of alleged obturator and ischiatic hernia have been recorded. The ventral forms occur most frequently, being usually situated below the navel, from separation of the recti muscles during pregnancy, and will not be considered here. The cases of other varieties than umbilical and ventral, except inguinal and crural, which are on record, viz., ischiatic and obturator, are probably apocryphal. Careful studies of the cases of inguinal and crural hernia of the uterus which are on record have been made from time to time by Cormack,<sup>1</sup> Klob,<sup>2</sup> Eisenhart,<sup>3</sup> Adams,<sup>4</sup> Winkel,<sup>5</sup> and Küstner,<sup>6</sup> who have compiled lists of the cases, more or less complete. A careful study of these papers shows that considerable confusion exists as to some of the cases in the early literature, both as to their authenticity and their exact nature. Thus the oldest case, that of Nicholas Pol (1531), has been claimed to be identical with one of those mentioned by Senertus and Hildanus (1610), while another described by these authors, and attributed to Doringius, is variously classified as inguinal and crural, or omitted. Another case, given by Skrivan and Lumpe as a true hernia of the pregnant uterus, has been ex-

cluded on the ground that it was an extra-uterine pregnancy. By a study and comparison of these papers and of many of the original references, and a review of the literature since their appearance, the following classification of the cases seems justified. It is practically the same as Küstner's, with the addition of six cases which he excluded, or overlooked, or which have been published since his article appeared. The pregnant uterus has occupied the sac of an inguinal hernia in whole or in part nine times (observations by Pol, Senertus, Saxtorph, Ladesma, Fischer, Rektorzik, Scanzoni, Winkel and Eisenhart, Rosanoff). The non-pregnant uterus has been previously observed in inguinal hernia at least twelve times (Maret, Lallement, Chopart, Olshausen, Leopold, Schwarz, Brohl, Krug, Defontaine, Legueu, Rouffart, and Diederich). Two undisputed cases of crural hernia of the non-pregnant womb have been recorded by Lallement, and Boivin and Dugès, and the case of Doringius previously mentioned, a hernia of the pregnant uterus, has been variously classified as inguinal, crural, or possibly between the muscular fibres of the abdominal wall, or altogether excluded.

The case of F. Krug<sup>7</sup> has not been included heretofore, Winkel and Küstner, writing since its publication, not mentioning it, but is an undoubted example of hernia of the non-pregnant uterus, left ovary and tube, of the left inguinal variety. The case of De Gouey,<sup>8</sup> of removal of a fœtus from a hernial sac, is, judging from the quaint and interesting account translated from the Sloane Manuscript, apparently an example of extra-uterine gestation, as the much-discussed case of Skri-  
van and Lumpe was finally decided to be. Other cases not included in previous statistics are those of Defontaine,<sup>9</sup> Legueu,<sup>10</sup> Rouffart,<sup>11</sup> and Diederich,<sup>12</sup> abstracts of which follow.

The unimpregnated uterus may be congenitally herniated, or the accident may occur in early life, or during or after the child-bearing period, usually when the pregnancies have been multiple and numerous; and the uterus may become impregnated in this condition. The pregnant uterus may also



enter a pre-existing hernia and pregnancy go on until the full term.

The etiology, symptomatology, and diagnosis of this condition have been given at length in the articles quoted, and it is unnecessary to dwell upon all of them. There are, however, several points suggested by the history of our case which are of interest. She was the mother of three children. Multiple pregnancies are an important predisposing factor to hernia of the womb. She had had a small, right inguinal hernia all her life, probably a congenital hernia, and perhaps of the ovary. The presence of a pre-existing hernia is a predisposing factor, and an ovary may be in the sac, and by its traction on the uterus, especially when adherent to the sac, and the latter is increasing in size, aid in drawing the uterus outward. In a relatively large proportion of these cases there are congenital anomalies present, as a rudimentary uterus, bicornute uterus, congenital hernia, imperforate vagina, pseudohermaphroditism, shortening of the round ligament, associated with increased liability to uterine hernia. In pre-existing hernia the sac probably often enlarges at the expense of the broad ligament on that side, making direct traction on the womb. The only organs in the sac were the uterus and its ligaments, the right ovary and tube, and part of the left tube. Both ovaries may accompany the uterus in its excursion, usually only one, that of the side on which the hernia is located. There was no omentum present, adhesion of which to the uterus might have caused its displacement by traction (Chopart's case). The patient was washing clothes when the accident occurred, probably bending over and exerting herself more than she acknowledges. Severe sudden exertion, causing increased intra-abdominal pressure, is an important exciting cause. It is a curious fact that both of Lallement's cases occurred in washerwomen. The uterus was probably practically strangulated, a unique accident. It was necrotic, splitting open under manipulation and discharging pus from its cavity. The microscopic examination also showed inflammatory changes in the tissues of the uterus.

*Diagnosis.*—No suspicion of the true nature of the contents of the hernia was entertained before operation. The diagnosis made was of probable omental hernia, from the absence of symptoms of intestinal obstruction. The presence of a pyriform mass, hard, perhaps irreducible, would be consistent with the presence of the uterus, and in some cases a smaller round or ovoid movable body alongside of it, the ovary, has been described, and a correct diagnosis arrived at. A vaginal examination before operation would have revealed an absence of the uterus from its normal position, and a change in the direction of the cervix and vagina. As Eisenhart points out, the introduction of a sound is difficult. A painful swelling of the herniated uterus during menstruation has been described. In pregnancy occurring in a herniated uterus, or in one horn of a bicornute uterus, the usual objective signs of pregnancy may be elicited as pregnancy progresses, the uterus meanwhile steadily increasing in size.

Return of the uterus would have been indicated had its condition permitted, but under the circumstances there was no alternative but hysterectomy. The left ovary was not prolapsed, and its removal was unnecessary. Conservation of the pelvic organs as far as possible, at least where functioning, would seem to be indicated.

In addition to the case here reported, operations for hernia of the non-pregnant uterus have been done by Leopold, Schwartz, Brohl, Krug, Defontaine, Legueu, Rouffart, and Diederich. Leopold<sup>13</sup> successfully excised one horn of a bicornute uterus, with the tube and ovary, from an inguinal hernia. There was an imperforate vagina in his case, as there was also in Schwartz's<sup>14</sup> case, in which there was a double congenital hernia, with failure of union of Müller's ducts, the right hernia containing a "uterus in miniature," which was replaced, the left containing a muscular cord, which was excised. The patient recovered.

Brohl's<sup>15</sup> case was a pseudohermaphrodite of the female sex, thirty-six years old, with a left inguinal hernia of six years' duration, which was correctly diagnosed before opera-

tion to contain the uterus and ovary. He amputated the uterus and both ovaries, one of which was rudimentary, and fastened the stump to Poupart's ligament to close the canal. The uterus was bicornute. This patient also recovered. His treatment of the stump was practically the same as that followed in our case.

Krug<sup>7</sup> operated on a left inguinal hernia of the uterus and ovary, congenital, the uterus reducible, the ovary adherent, in an unmarried girl aged nineteen years. The hernia had existed as long as she could remember; symptoms for five months only. A correct diagnosis of the contents was made before operation. The sac was apparently formed from the left broad ligament, explaining the irreducibility of the ovary, which was adherent to it. The uterus was reduced, the left tube and ovary removed, and the sac excised; closure by the McBurney method. The patient died fifteen days after operation, apparently of an intense anæmia, with cardiac degeneration; no sepsis. Post-mortem examination showed the right broad ligament exceedingly long, running behind the posterior surface of the uterus, so that the right tube and ovary were on the left side of the uterus.

L. Defontaine<sup>9</sup> performed radical cure on a hernia, left inguinal, existing for five months, in a child aged seven months. It contained the uterus and both ovaries, being complete of the uterus, and the contents were returned to the abdomen after digital divulsion of the rings.

Legueu<sup>10</sup> reports a case of left inguinal hernia in a girl of eighteen years, congenital, and containing the uterus, which was very small, one ovary, and both malformed Fallopian tubes, one ovary being wanting. The vagina was imperforate. He operated, reduced the organs into the abdomen, and the patient recovered.

Rouffart<sup>11</sup> reports a case in a girl aged twenty-two years, with congenital hernia, which for three weeks had been very painful and sensitive. The vagina was imperforate, the other sexual characteristics well developed. On operation the uterus was found rudimentary, apparently unicornute, adherent to the

sac, the left tube and ovary in the abdomen, the right absent. These organs were removed, and the patient recovered. It may be noted that this case is an exception to the almost universal rule that at least one ovary is present in the hernia with the uterus.

Diederich<sup>12</sup> reports a case similar to Rouffart's, in a girl of twenty-one years, also with imperforate vagina, in which the rudimentary uterus, with the left ovary and tube, was removed. The right adnexa were not discovered.

The frequent association of imperforate vagina with a rudimentary congenitally herniated uterus in the cases reported in recent literature is of interest. It is probable that the more frequent performance of operations for radical cure has revealed cases of this nature which were previously assumed to be herniæ of common types.

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## SUTURE OF THE BRACHIAL ARTERY.

BY GASTON TORRANCE, M.D.,

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Surgeon to St. Vincent's Hospital.

ON December 21, 1903, John Roberts, white, aged seventeen years, while working in the mines, had his left arm badly crushed about midway between the elbow and shoulder by the wheels of one of the cars. The muscles on the outer side of the arm were badly lacerated, exposing the bone, and the coal-dust was so deeply ground into the tissues that it was impossible to remove it. He was brought to St. Vincent's Hospital late that afternoon. A wet dressing was applied by the resident. I saw him the following morning. His temperature was then above 103° F. I introduced a small rubber tube on the inner side of the arm and put on a constant irrigation of bichloride 1 : 4000. The fever immediately began to subside, and at the end of a week the wound was perfectly clean and the irrigation was discontinued.

On December 28 the arm began to bleed profusely. The Sister in charge of the ward applied a bandage firmly just below the shoulder, and controlled the hæmorrhage until he could be brought down to the operating room, where I saw him at once. Upon opening the wound, the artery showed a funnel-shaped ulcer which had perforated, the opening being about as large as the point of a pencil, and at every pulse-beat the whole of the blood stream was forced out through this opening. There was no sign of a radial pulse, and the arm was cold and œdematous, and of a dark color.

My first impulse was to catch up the artery with a pair of forceps and ligate it, but, remembering Dr. Crile's work on temporary ligature of blood-vessels, I decided to try to suture the wound, trusting that the blood had not clotted in the distal end. While waiting for the instruments and suture material, the hæmorrhage was controlled by pressure. My first suture was introduced with the arm extended, but tore out when tied, and I saw that it would be necessary to flex the arm and keep it in that position.

I used a small, full-curved intestinal needle with fine silk, introducing it as a purse-string, and upon tying it found that it completely controlled the bleeding. Only one suture was used. A portion of the muscle was dissected up and grafted over the sutured portion of the artery. A dry dressing was applied, and the arm put up in a right angle external tin splint. The hand was slightly elevated and placed on a large hot-water bottle. I could not find the radial pulse when the operation was finished. I saw him again about five hours later, and the radial pulse was as strong as in the other arm, and the puffiness had left the arm, which was now warm and normal in appearance.

A close watch was kept day and night for a week in case the suture should give way.

He was kept in bed about two weeks, and the arm was kept in the splint for two months.

The muscle graft grew over the artery firmly, and could be watched for several weeks before the skin-flaps covered it over.

The wound has healed up perfectly over the sutured artery, and he is beginning to use the arm some.

## PYÆMIC GLANDERS IN THE HUMAN SUBJECT.

REPORT OF A RECENT CASE OF LABORATORY ORIGIN TERMINATING IN RECOVERY.

BY J. CLARK STEWART, M.D.,

OF MINNEAPOLIS, MINN.,

Professor of Principles of Surgery in the Medical Department of the University of Minnesota.

THIS case occurred in one of the assistant bacteriologists of the Minnesota State Board of Health, and was due to accidental infection while working upon material from two fatal cases of human glanders which occurred near Perham, Minnesota.

Dr. McD., aged twenty-seven years, previously in perfect health, had been working with this material for some weeks when she became slightly indisposed, and after a few days was compelled to go to bed with symptoms resembling typhoid fever. On Saturday afternoon, June 21, she had malaise, and in the evening noticed a headache and slight backache. After about an hour's sleep she was awakened by darting pains through the back and lower extremities. The pains steadily increased in severity and extended in less marked degree to the chest and arms. The feet and legs were cold, but no chill or chilly sensations were experienced. The body and head felt very hot and dry, and the pains persisted for about twelve hours. Sometime during the first twelve hours a pain was referred to the region of the diaphragm, which persisted for about five days, and was aggravated by respiratory movements. During the first few hours of the attack nausea was present, but there was no vomiting at any time. There was heavy sweating during the afternoon and night of the second day, which at first was thought due to the administration of salicylates, but it continued to a marked degree during the first two weeks of the illness. The temperature when first taken, about six hours after onset of the pains, was 102.8° F. In six hours more it reached 104.5° F., and it then receded, being at 4 P.M. on the second day 103° F.; at 9 P.M. 102.8° F.; at 8 A.M. on the third day 100.5° F.; at 7 P.M. 100° F.; on the fourth day at 8 A.M.



98.8° F. The patient remained in bed two days, and on the morning of the fourth day got up (temperature normal), walked several blocks and remained up all day. In the evening the temperature was found to be 102.8° F. On the evening of the seventh day an oval œdematous swelling about two inches long appeared at the right wrist over the region of the ulnar nerve, which was quite sensitive to pressure. Another less prominent swelling was present in the left arm at the outer border of the biceps, extending downward from midpoint of biceps about three inches, the width being about three-fourths of an inch, and this was also extremely sensitive to pressure. Deep in the calf muscles of the right leg was a third tender region two or more inches in length, which could not be definitely outlined.

On the eighth day the swellings were more prominent, especially the one on the wrist over which the skin was slightly reddened. This redness had disappeared on the ninth day when the patient was first seen by me. There was then marked induration about the original point of the swelling in the left arm, and the right calf was noticeably fuller over the inner aspect. Blood count (Dr. White) showed 8500 leucocytes.

On July 8, I incised the swelling at the right wrist under local anæsthesia and opened a cavity, evacuating about a drachm of purulent material which seemed surrounded by an albuminous covering, so that it came out like the yolk of an egg surrounded by the white. The cavity was then packed with iodoform gauze after mopping it and the skin incision with 95 per cent. carbolic followed by alcohol.

Cultures (Dr. Beckmann) from the pus removed gave a pure growth of *Bacillus mallei*, and several guinea-pigs inoculated intraperitoneally with two cubic centimetres of a broth emulsion of the pus died in from twenty-four hours to four days.

The organism recovered at this time seemed slightly less virulent than that from the cases from which the inoculation occurred.

After this, the treatment of the other swellings in the left biceps muscle and in the calf of the right leg was considered; operation upon these was postponed to allow time for encapsulation, because the fever seemed to be dying out and no other lesions were appearing, and also to determine whether new lesions would appear as the result of the opening of the first focus. On July 22 an attempt was made to dissect out the bicipital focus intact

without opening the abscess, but this failing, the wound was filled with 95 per cent. carbolic, through which the pus was allowed to escape and mopped away, when the wound was filled with alcohol and dried and packed with iodoform gauze.

This focus was situated entirely within the biceps muscle and had destroyed quite an extent of the muscular fibres.

In the leg a careful dissection was made from behind through the calf dividing the gastrocnemius and soleus in the middle line, and the abscess cavity was found between the soleus and the deeper muscles apparently formed at the expense of the latter. In this case the large wound was filled with 95 per cent. carbolic and the abscess incised through this, and after removal of the pus the muscles and skin were sutured, leaving only a central opening for packing the abscess cavity. At the same time the original wound at the wrist was curretted and carbolized.

All the wounds healed kindly without any skin infection, but it was over two months before healing was complete.

Cultures (Dr. Beckmann) from all the foci at the time of the operation showed virulent pure growths of *Bacillus mallei*, and one week later the dressings from all the wounds showed the bacilli, but in very small numbers.\*

On August 5, an inflamed lymph node was enucleated from the left submaxillary region, it having been tender and swollen for only about four days, and within this was a purulent focus containing virulent *Bacilli mallei*. This wound was carbolized. During this time the fever had been quite constant, but varying widely, with an afternoon rise from  $100^{\circ}$  to  $103^{\circ}$  F. Ten days after the removal of the last focus the temperature dropped to normal, and remained so with slight occasional exacerbations until September 22, when after attempting to do a little work at the laboratory she had a slight chill, headache, backache, and malaise, with some purpuric spots on abdomen and legs, and temperature ran up to  $103.5^{\circ}$  F. After three days the temperature rapidly dropped to normal and remained normal and subnormal for three days until Septem-

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\* A full account of the bacteriological findings in this case, and also in the two from which the infection arose, with the details of the work done on them in the Laboratory of the Minnesota State Board of Health, Dr. F. F. Insbrook, Director, can be found in his annual report for 1903-1904.

ber 28, when after walking several blocks the temperature again rose without a chill to  $104^{\circ}$  F. in the afternoon, and remained high (above  $103^{\circ}$  F.) until October 2, when it began to subside, reaching normal the next day. During this attack of pyrexia a second purpuric eruption appeared scantily over the limbs and abdomen. October 7, the temperature again rose gradually and dropped to normal on the 10th, remained below normal three days, after which time there were no marked exacerbations, but a quite regular afternoon rise to  $99\frac{1}{2}^{\circ}$  and  $100\frac{1}{2}^{\circ}$  F., which persisted until the latter part of May, 1903.

During the febrile attacks there were no local symptoms except a heavy feeling and ill-defined pain near the insertion of the diaphragm upon the vertebral column. There was never any definite tenderness anywhere in the abdomen, but only an ill-defined discomfort behind the stomach to the left side, not associated in any way with the taking of food.

At the time of the first pyrexial attack all the wounds were solidly healed except a small sinus in the left arm, and this healed during the persistence of high temperatures.

After this the patient's general condition improved, and she seemed well except for the slight afternoon rise. She spent the summer out of doors and in the fall seemed as well as ever. She has since had no fever nor any symptoms pointing to a persistence of the infection.

This case seems worthy of record from its most fortunate termination and the extreme rarity of laboratory glanders. Certain points seem of especial interest.

First, its origin from two cases of most virulent pyæmic glanders in young men owing their infection to contact with diseased horses. Both cases began with symptoms resembling typhoid fever, rapidly passing into those of sepsis. Both died on the seventeenth day with multiple abscesses in the skin and subcutaneous tissue, the skin lesions being so numerous as to excite the suspicion of smallpox.

Second. The incubation period in Dr. McD.'s case was six days, figuring from the only known chance of infection, she having made an autopsy upon an inoculated guinea-pig on

June 16, and having at that time a small open wound on her finger.

Third. The absence of the lesions of the skin and mucous membranes which are so common in most cases of glanders, and the limitation of the original foci to the voluntary muscles.

The points aimed at in the surgical treatment of the case after an exact diagnosis had been made, were, first, delay in hopes that the foci might become encapsulated by inflammatory changes in the surrounding tissues, and that the patient might become as far as possible immune by the manufacture of her own mallein. Second, the avoidance of local implantation of *Bacilli mallei* upon wound surfaces when foci were eradicated.

Several methods aiming at the prevention of inoculation were suggested, including the actual cautery; but the use of 95 per cent carbolic and alcohol on all the cut tissues before exposing them to pus contact proved entirely satisfactory in preventing further local lesions, and allowed the wounds to heal promptly except where the packing and anatomical conditions favored the persistence of a sinus.

It is difficult to account for the train of symptoms arising after all the wounds were practically closed. The repeated attacks of high fever, general prostration, aching, etc., with purpura, certainly suggested some internal glandular focus, but the subsequent complete though tardy recovery would seem to negate this view.

The medical and surgical treatment used throughout was an attempt to meet as far as known the theoretical conditions present, and that it was successful is a matter of constant self-congratulation on my part and on the part of my colleagues in the Pathological Department of the University of Minnesota and the Minnesota State Board of Health.

# TRANSACTIONS

OF THE

## NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, February 24, 1904.*

The President, HOWARD LILIENTHAL, M.D., in the Chair.

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### TRAUMATIC RUPTURE OF SPLEEN; SPLENECTOMY.

DR. IRVING S. HAYNES presented an Italian boy, nine years old, who, on December 28, 1903, at one o'clock in the afternoon, was run over by a light buggy, the wheel (or wheels) traversing his body from the splenic region to the left groin, and down between the legs.

On admission to the hospital the patient was in a condition of shock, but conscious. The abdomen was rigid and tender over the splenic and left inguinal regions, and the child complained of colicky pains. Upon admission, his temperature was 97.8° F.; pulse, 92; respirations, 26. After the administration of a saline enema, an ice-cap was applied to the abdomen, and the patient was stimulated with strychnine and whiskey. At 5 P.M. his temperature had risen to 100.3° F.; pulse, 104; respirations, 28. At 9 P.M. his temperature was 100° F.; pulse, 138; respirations, 40. At 1 A.M. his temperature was 98.6° F.; pulse, 140; respirations, 48. As the patient's condition was evidently growing worse, and evidences of internal hæmorrhage were more marked, an exploratory laparotomy was deemed advisable. Under chloroform anæsthesia an incision was made in the median line, a little below the umbilicus. The abdominal cavity was found filled with bloody fluid, which escaped on opening the peritoneum. The intestines

were hastily examined, but nothing found. As the child had complained of pain over the upper left quadrant of the abdomen, a second incision, four inches long, was made in the left semilunar line. On palpating the spleen, that organ was found to be ruptured, its entire anterior border being severed from the body of the organ with the exception of a very narrow pedicle. The severed section was about the size of an adult forefinger. The incision was enlarged by a right-angled cut running two inches to the left. The spleen was then loosened from its attachments and brought near the opening, with the intention of placing a row of mattress sutures parallel with the crushed surface and removing the torn section. As the organ was being carefully manipulated, and the pedicle held between the fingers, something was felt to loosen and slip. Fearing that a rupture of the blood-vessels was imminent, a clamp was at once placed upon the pedicle and the spleen cut away. A catgut ligature (chromic, No. 2) was then placed on the pedicle internal to the clamp, which was left in place as an additional safeguard. The child's condition being very serious, a saline enema was administered and hypodermic stimulation was freely resorted to. The abdominal wounds were rapidly closed with through-and-through silkworm-gut sutures.

On the first day after the operation the temperature reached  $101.6^{\circ}$  F.; pulse, 132; respirations, 52. Free stimulation and saline enemas were resorted to. During the day the child vomited some brownish fluid. On the following day the temperature reached  $102^{\circ}$  F.; pulse, 138; respirations, 40. On this day the patient vomited a bright green fluid. The clamp was removed. On the third day the temperature fell to  $100^{\circ}$  F.; pulse, 136; respirations, 38. Saline and nutrient enemas were continued. The patient had three stools. The urine was normal. From this time on convalescence was uneventful until the twentieth day, when the temperature suddenly rose to  $106.2^{\circ}$  F.; pulse, 152; respirations, 32; this followed a distinct chill during the night. A physical examination of the chest revealed slightly roughened breathing sounds. This soon cleared up, and the temperature fell to normal within twenty-four hours. The patient was discharged cured on January 31, 1904.

The following was the result of blood examinations made by Dr. Krauskopf:

January, 1904.	White Cells.	Red Cells.	Hæmoglobin, Per Cent.
3 .....	20,600	4,800,000	85
5 .....	18,600	4,700,000	85
7 .....	17,600	4,950,000	90
9 .....	16,000	4,800,000	95
11 .....	20,000	5,000,000	100
14 .....	18,000	5,000,000	100
31 .....	18,000	5,000,000	100
Urine, normal.			
Fæces, normal.			

#### PERFORATED GASTRIC ULCER.

DR. CHARLES H. PECK presented a man, aged twenty-three years, who was admitted to Roosevelt Hospital, in the service of Dr. Robert F. Weir, at 5 A.M., January 10, 1904. A diagnosis of perforated gastric ulcer had been made by the ambulance surgeon. This was confirmed by the house surgeon and the operator, and an immediate operation was performed four hours after the onset of acute symptoms of perforation.

The patient's history was as follows: Measles in childhood, pneumonia three years ago. For two years the patient has been troubled with indigestion; after eating he would have severe abdominal pain, knife-like in character. He frequently vomited soon after eating; sometimes the pain was so severe that he irritated his pharynx and made himself vomit; he had never vomited blood, nor passed blood by the bowels. Five months ago he was in Bellevue Hospital for a week for his pain after eating. Was told it was imaginary and sent home.

*Present Illness.*—Last night at nine o'clock he ate a light supper, as he did not feel well; had some abdominal discomfort. He went to bed about twelve o'clock, and about two hours later he was awakened by a terrible sudden cramp in the stomach; he cried out in agony, and felt a desire to defecate. He felt terribly weak and prostrated; the pain continuing, he drank a lot of water, which he soon vomited; it was bloody; two hours later the ambulance was sent for and he was brought to the hospital.

On admission his temperature was 98.4° F.; pulse, 124; respirations, 28. There was marked general tenderness over the entire abdomen, with extreme rigidity, both tenderness and rigidity being greatest in the epigastrium. No loss of liver dullness was noted; distention was very moderate; face pale, drawn, and anxious.



Operation at 6 A.M.; ether. A four-inch median incision above umbilicus; on opening peritoneum a quantity of gas and some turbid serum escaped. Pyloric end of stomach was pulled into view, and a perforation about one-fourth inch in diameter exposed on anterior aspect of pylorus, from which gas and fluid were escaping. Stomach wall for some distance around perforation was much thickened and infiltrated, the cystic duct and pylorus being matted together in the inflammatory mass. The perforation was buried with three tiers of continuous Lembert sutures of black silk, with some difficulty on account of infiltration of tissues. Escaped stomach contents and turbid serum bathed the entire peritoneal surface except lesser cavity; a considerable quantity was present in the pelvis and in both flanks, also between liver and diaphragm. Thorough flushing with a Blake tube and salt solution until fluid returned clear; a cigarette drain then placed down to suture line in stomach wall and the rest of wound closed by layers.

*Course.*—Temperature rose to 102° F. after operation, then gradually fell, remaining below 100° (rectum) after the third day; pulse, 130 after operation, dropped to 80 on third day and remained normal. The day following the operation he vomited a few times, the vomiting at one time being projectile in character; his bowels were moved by enema thirty hours after operation, and the vomiting soon subsided. Saline enemata and later nutritive enemata were given for the first three days. Hot water by mouth on the second day, milk up to four ounces every two hours on the third day. Solid food was commenced on the eighth day and increased gradually. Sat up on the nineteenth day and left the hospital well on February 1, the twenty-second day after the operation.

DR. PECK also presented a man, aged twenty-two years, who was admitted to Roosevelt Hospital, in the service of Dr. Robert F. Weir, early in the evening of January 21, 1904.

The probable diagnosis of perforated gastric ulcer was made by the house surgeon. His history was as follows: He had been troubled with pain in left inguinal region and outer and anterior aspect of thigh for some months, and had been under treatment for it. Was never troubled with indigestion until about three weeks before admission, since when he has had pain after eating and occasional vomiting. He worked as usual on the day

of admission until 4 P.M., when, after lifting some heavy glass, he was suddenly seized with severe cramps in the abdomen. He was obliged to stop work immediately and went to a neighboring saloon, where he was given a drink of brandy. He vomited it in a few minutes, and the pain became so violent that he laid on the floor and rolled in agony; the ambulance was sent for at once.

On admission his temperature was 102.2° F.; pulse, 124; respirations, 28. Leucocyte count, 16,000. There was marked general tenderness and rigidity over entire abdomen, somewhat greater above umbilicus, but not distinctly localized. The greatest pain was in left inguinal region and upper, anterior aspect of thigh, the old location. There was almost complete loss of liver dullness, and flatness in both flanks, which changed its level as patient was turned from side to side. No distention. Cardiac and pulmonary signs normal; general condition good.

Operation at 10 P.M.; ether. A four-inch median incision above umbilicus. Gas escaped on opening peritoneum, with some turbid serum. Flakes of lymph seen on anterior surface of stomach and under surface of liver, as well as on surrounding peritoneum. The anterior surface of the stomach was lightly adherent to the under surface of the liver by recent lymph; when separated by the hand, a perforation in the anterior stomach wall, about 1.5 to two inches from pylorus and midway between greater and lesser curvatures, was seen; it was about one-fourth inch in diameter, and gas and stomach contents escaped; the stomach wall around it was much thickened and indurated for a radius of one inch or more. The opening was closed with two tiers of black silk continuous Lembert stitches. The entire abdominal cavity was then irrigated thoroughly with a Blake tube and salt solution, and considerable turbid fluid washed from flanks and pelvis and sub-diaphragmatic region. A single large cigarette drain was placed down to suture line, and the abdominal wall closed by layers except at this point, no attempt being made to drain peritoneal cavity. The usual dressing of moist bichloride and dry gauze; time, 50 minutes; condition good.

*Course.*—Vomited twice while coming out of ether; not at all afterwards. Temperature ranged from 100.6° to 102.2° F. during the first three days, gradually falling to 100°, the pulse ranging from 136 down to 108. Saline enemata were given for the first day; hot water by mouth in small quantities during the second

day. Bowels moved by enema on second day. On January 24, the third day after operation, his temperature suddenly rose to 103.4° F.; pulse, 140; he was very restless, and coughed a good deal. The wound was dressed and showed no signs of infection; the abdomen was soft and the leucocyte count 9000. From this time on convalescence was uneventful, the temperature remaining below 100° F. and pulse below 90 after the fifth day. The drain was removed on the fourth day and all drainage left out after the sixth day. Milk and lime water by mouth commenced on the fourth day, soft diet on the eighth day. Sat up on February 10, nineteen days after operation, and left the hospital well on February 13, twenty-two days after the operation.

#### STRANGULATED HERNIA, WITH RESECTION OF THE INTESTINE.

DR. PECK presented a man, aged forty-seven years, who was admitted to Roosevelt Hospital, in the service of Dr. Robert F. Weir, January 17, 1904. For twenty years the man had had a reducible right inguinal rupture. He wore a truss at intervals, and at times the hernia would disappear for a year or more and be apparently cured, until some strong exertion brought it down again. Six months ago it was irreducible for two days. Patient never had any very serious illness. He is a moderate user of alcohol.

*Present Illness.*—Eight days before admission, the rupture came down and could not be reduced. It had gradually become more and more tender and painful. Five days before admission he began to vomit with increasing frequency, and for two days could retain nothing whatever.

His vomitus had never been fecal. His bowels had not acted for five days and the abdomen was somewhat distended. His general condition was fairly good. Locally, there was an oblique, irreducible, tender, tympanitic, inguinal hernia the size of a goose-egg (on the right side). Skin not discolored over it. There was a distinct impulse on coughing, which suggested that the hernia was obstructed, not strangulated. The right testicle was not in the scrotum.

Operation, four hours after admission by the House Surgeon, Dr. Whittemore. Ether. Incision as for ordinary Bassini. The

tunic of the undescended right testicle (which lay just outside the inguinal canal) was first opened by mistake. On opening the sac a small amount of turbid fluid escaped and a loop of small intestine, four inches in length, of very dark color and slightly coated with lymph, was disclosed. After dividing the constricting band and drawing down the loop, the major portion of the gut slowly regained its color. An area about the size of a dollar at the point of constriction, however, did not recover, and after waiting ten minutes a resection was decided upon. In order to get normal intestine for approximation, about eight inches were resected. The ends were united with a medium-sized Murphy button in the usual manner, reinforced all around with continuous Lembert sutures. In order to return the button to the abdominal cavity, it was necessary to divide the internal oblique and transversalis for about an inch at their origin from Poupart's ligament. The button was left just inside the ring, and a single cigarette drain placed, leading down to it. The wound was closed, as far as practicable, according to Bassini.

*Postoperative Course.*—No vomiting after operation. Several enemata of saline were given for thirst in first twenty-four hours; then water was given by mouth and soon afterwards milk. At the end of sixty hours an enema was returned with a fair amount of faecal matter. Wound dressed on fourth day and a narrow gauze tape substituted for cigarette drain. Wound closed rapidly. A cathartic was never given, his bowels remaining open with the aid of an occasional enema. Patient was kept on "soft diet" until after the escape of the button. On the nineteenth day an X-ray picture located the button in the upper pelvis, but it could not be felt, nor did high enemata bring it away. It was discharged spontaneously on the twenty-fourth day. Discharged, cured, on February 14, the twenty-eighth day after operation.

#### CONGENITAL DEFORMITY OF THE RIGHT LOWER EXTREMITY.

DR. ROYAL WHITMAN presented a female child, three years of age, with a congenital defect of the right lower extremity, the fibula on that side being entirely absent. As a result of this defect, there was considerable shortening, and, in order to remedy this, a surgeon who had seen the patient soon after birth had shortened the other limb by removing a section of the femur. The remedy

did not prove effective, however, for, as in all cases of this type, the shortening had been progressive, amounting at the present time to two and one-half inches. The chief interest in the case was the remedy that had been employed.

FRACTURE OF THE FEMUR PRODUCED BY AN OBSCURE  
LESION OF THE BONE.

DR. WHITMAN presented a young man, who came to the Hospital for Ruptured and Crippled a few weeks ago, with a resistant enlargement of the upper third of the right thigh, and about one inch shortening on that side. He stated that up to four months ago he was perfectly well. Then, without apparent cause, he began to have some pain about the right hip. This pain was severe enough to keep him in the house. About a week after its onset he accidentally kicked a chair, and immediately fell to the floor. The leg was entirely useless, and he was obliged to remain in bed for about a month. He was then able to go about the house with the aid of two sticks, and three weeks later he began to go out. In the meantime, an enormous swelling had developed over the upper part of the thigh, and when the patient was first examined the case was regarded as one of sarcoma of the femur, with spontaneous fracture. Since then, however, the swelling, instead of increasing, has become somewhat less. An X-ray photograph was taken, which showed that the fracture had occurred in the neighborhood of the trochanter minor. There was moderate outward rotation of the limb, firm union, and the patient walks about without discomfort.

Dr. Whitman said the only way he could account for the course of events in this case was that the weakness and subsequent fracture of the bone were due to the presence of a congenital cyst or to a mild form of osteomyelitis. The swelling he attributed to the deformity and exuberant callus resulting from improper apposition of the fragments. The speaker said he had never seen a parallel case.

DR. F. KAMMERER said he did not think the diagnosis of sarcoma could be absolutely excluded, because the growth had lately decreased somewhat in size. It was still rather large to be attributed to exuberant callus. In answer to a question of the President as to the nature of the growth in the bone (femur) of a case he had shown at the meeting of the Society some months ago

(ANNALS OF SURGERY, January, 1904), the speaker said that on cutting down upon the femur he found a hard, fibrous mass occupying the entire medullary canal. It extended from the trochanter down to the condyles at the knee, and, after chiselling open the whole bone, the mass could be removed in large pieces. The pathologist reported that the growth was purely fibrous in character. There had been no evidences of a recurrence, and since the operation the bone cavity was gradually filling up with granulation tissue. The deformity had increased, and a secondary operation would be necessary to correct it. Sarcoma and syphilis must be excluded. The case was certainly a very unusual one. Perhaps the further course might throw additional light on the etiology.

DR. WHITMAN said the X-ray picture apparently showed an overlapping of the short upper fragment. The callous formation was exuberant, but not more perhaps than might be explained by an untreated fracture. If the case were malignant in character, such a rapid union of the bone would be very unusual. The man gave no history of syphilis, and showed no evidences of that disease; and if syphilis could induce such fragility, it would also prevent union in all probability.

#### INTESTINAL OBSTRUCTION FOLLOWING OPERATION FOR APPENDICITIS.

DR. JOHN ROGERS presented a young man who was operated on for appendicitis about two years ago. On September 29, 1903, he committed some indiscretion in diet, and on the following day he vomited and passed some gas per rectum. On the following three days "bilious vomiting" continued, and the patient complained of some pain in the abdomen, but he was able to go about.

On the fifth day of the attack, when Dr. Rogers first saw him, the patient appeared fairly comfortable, but a little weak from lack of food. There were no abnormal physical signs. The mother stated that an enema had brought away some faecal matter, and that gas had been passed. The urine was scanty. The patient's temperature was 101° F.; pulse, 125.

Because of the lack of physical signs, it was decided to postpone operative interference. During the next twenty-four hours the vomiting continued, and on the seventh day it had a faecal odor. An exploratory operation was therefore decided on, although the belly was still perfectly soft; there was no distention,



rigidity, or pain. A median incision was made just below the umbilicus, and upon inspection a band was found starting at the cæcum, passing upward and inward along the free border of the omentum, and constricting the jejunum transversely at a point about two feet from its origin. After dividing the band, this underlying intestine presented a ring of gangrene about one-half an inch wide where it had been constricted, and it was therefore necessary to resect the gut at this point. The two divided ends were then brought together over a Murphy button. The patient made an uneventful recovery. The button was passed on the thirty-eighth day.

The case was interesting, Dr. Rogers said, on account of the total absence of any local signs of obstruction, and because of the small quantity of urine secreted during the patient's illness. On the last day of his illness he did not pass any urine. This last symptom, Dr. Rogers said, had been noted in a number of cases where the obstruction of the intestines was high up. In addition to all this there is of course the interest attaching to the obstruction which followed, and seemed directly dependent upon the preceding operation for appendicitis. A subsequent obstruction seems a possibility, which, though remote, is unavoidable.

DR. CHARLES L. GIBSON said the question arose whether the adhesive bands were the result of an operation for appendicitis or were due to the primary condition. In the latter case, they should be regarded as an additional element of danger, and emphasized the importance of the prophylactic treatment of appendicitis by operating during the quiescent stage. The speaker said that personally he was inclined to believe that the bands were the result of the appendicitis, and not the operation.

DR. CHARLES H. PECK said that very recently he saw a case of intestinal obstruction at Roosevelt Hospital following an operation for appendicitis. The operation, which was an interval one, had been done about a year before, and no drainage had been employed. The cause of the obstruction was an adhesive band constricting the ileum. The patient was in a very bad condition, and died from the effects of the operation. Dr. Peck said this was the only case he had seen where adhesive bands causing obstruction had followed an interval operation.

DR. JOHN F. ERDMANN said he thought it was a question whether the band in the case reported by Dr. Rogers was a result



of the operation for appendicitis, or a pre-existing condition, and one of the causes that demanded the primary operation. The speaker said he had recently seen two cases of appendicitis where these bands were found, and where no previous operation had been done.

DR. PECK said that in the case he had mentioned, the presence of the adhesive band had appeared to him to be a postoperative condition. He did not think it was present prior to the primary operation, although he was unable to make any positive statement on that point.

DR. ELLSWORTH ELIOT, JR., said he had seen two cases of intestinal obstruction after interval operations for appendicitis, one six months after the primary operation, the other eight months. In both cases, the speaker said, he had done the original operation, and in one of them the secondary operation also. In the first case, which was followed by intestinal obstruction, the stump of the appendix was cauterized and dropped back, and when the abdomen was subsequently reopened to relieve the obstruction it was found that adhesions had formed to the stump of the appendix. Warned by that experience, Dr. Eliot said he had since inverted the stump; but in spite of that procedure, he had had one other case where obstruction occurred. One of his cases recovered. In the other, where the operation was done outside the hospital, the patient died. Dr. Eliot said he had heard of other cases where intestinal obstruction developed after an interval operation for appendicitis.

DR. LILIENTHAL said he thought the method of inverting the stump of the appendix would invite the formation of adhesions, while simple cauterization of the stump would prevent them. In the latter case the little stump was cast off in a very few days, and with it any adhesions which might have formed. The speaker said he had had the opportunity of examining a number of those cases, and had reported his experience in a paper which recently appeared in the *New York Medical News*. He had never seen adhesions at the point where the appendix had been cut off and cauterized, and he regarded that method as safer and more rapid than the inversion method.

#### SOME REMARKS ON TUMORS OF THE CHIASM, WITH A PROPOSAL HOW TO REACH THE SAME BY OPERATION.

DR. OTTO G. T. KILIANI read a paper with the above title, for which see page 35.

DR. LILIENTHAL said that in his capacity of chairman of the medical equipment committee of the new Mount Sinai Hospital he had investigated the subject of surgical engines, but the committee had not yet decided which one to purchase. He suggested that the handle of the instrument should be so constructed that it could be held steady, and every precaution should be taken not to lacerate the dura. With the old-fashioned instrument for cutting through the skull, the breaking of the cables caused a good deal of annoyance. In the drilling-engine used by dentists, a cord and jointed arm were substituted for the cable, and this gave much better satisfaction, because it was less likely to get out of order and was easily repaired. Dr. Lilienthal said that dentists had recommended, as the best surgical engine, one devised by Dr. Cryer, of Philadelphia, a dentist. It was expensive, but very powerful and adaptable.

DR. KILIANI said that with the instrument he had described the fraise was of tempered steel, and cut so readily that extreme pressure upon the handle was unnecessary; in fact, it could be held almost as lightly as a pencil. There was little or no danger of injuring the dura.

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*Stated Meeting, March 9, 1904.*

The President, HOWARD LILIENTHAL, M.D., in the Chair.

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#### RESECTION OF KNEE FOR TUBERCULOSIS.

DR. JOHN A. HARTWELL presented a negro, twenty-eight years old, who was admitted to the Lincoln Hospital in March, 1902, with the history of having had some trouble with the left knee, the condition having existed about a year. It began with pain, and went on to a typical case of tuberculosis of the knee-joint. When he first came under observation there was a large quantity of fluid in the joint and over the internal tuberosity of the tibia, and the suppuration had progressed to such a degree that the bone was almost exposed.

Upon opening the joint through a transverse incision, it was found that the lower end of the femur was more or less diseased, and about one inch of the bone was removed. In the tibia the disease had extended down into the medullary canal for a distance

of fully two and one-half inches, and, as a radical operation would have necessitated the removal of at least three inches of the bone, it was deemed advisable to resect only the articular end of the tibia, scrape out the diseased tissue in the medullary cavity, and then fill it with an emulsion of iodoform. All the tubercular tissue in the capsule and in the periarticular spaces was carefully cleaned away and the lower end of the femur and the upper end of the tibia were then sutured with chromic gut. The wound discharged freely for several weeks, but finally healed entirely with the exception of a small sinus, through which a piece of chromic gut was removed about a year after the operation. Ankylosis was complete, and the patient walked with a slight limp only. In reply to a question, Dr. Hartwell said there was an inch and one-half shortening on the affected side.

#### INGUINOPERINEAL HERNIA.

DR. WILLIAM B. COLEY presented a man, thirty-eight years old, who was operated on in September, 1902, for this very rare variety of hernia, in which the testis and hernial sac occupied the perineum instead of the scrotum. At the time of the operation, the testis was considerably atrophied; it was transplanted into the empty scrotum, but, on account of the rather short cord, it could not be carried down into the bottom of the scrotum.

Dr. Coley said he had operated on five similar cases, in one of which the tumor was as large as a cocoanut. In three of his cases he had successfully transplanted the testis into the scrotum. All of these cases were on the right side.

#### FOREIGN BODY (WOVEN BOUGIE) IN RETROPERITONEAL SPACE.

DR. HOWARD LILIETHAL presented a woman, twenty-nine years of age, who was admitted to hospital on December 1, 1903. She had been married four years, had had one child and two miscarriages. The last abortion was said to have been self-induced on July 1, 1903, in the early months of pregnancy, by means of the introduction of a woven instrument. This woven bougie, previously boiled, and used only after the patient had washed her hands and taken a douche, was said to have been inserted into the uterus and left there. The next day there were cramps and some slight bleeding, one clot of considerable size being expelled. The instrument was not found after the abortion. Menstruation ap-

peared again in October, and again in November, there having been no appearance of blood in the meantime. For five weeks after the introduction of the bougie the patient was sick in bed with chills and fever, accompanied by profuse sweating and a throbbing pain in the left side from the pelvis to the ribs, and in the right loin. A swelling appeared soon after the miscarriage, occupying the left iliac region. It was quite tender to pressure. The patient had been out of bed since the 17th of August, but said that she had occasional fever and rapid pulse. She had lost twenty-two pounds in weight from July 1 to the date of her admission, December 1.

On examination, a hard mass, the size of a large fist, was felt occupying the left iliac region, and apparently adherent to the abdominal wall. From the upper section of this mass, a long, indurated portion extended upward, apparently along the posterior abdominal parietes, about in the direction of the ureter, until it was lost beneath the ribs. The entire mass was but slightly sensitive to pressure. Examination by vagina and by rectum did not indicate close relations with the pelvic organs.

The patient's general condition was very good, and there was little, if any, abnormality of pulse or temperature.

On December 5, under gas and ether anæsthesia, Dr. Lilienthal made an incision into the lower portion of the mass through the abdomen. After penetrating to the depth of about an inch into tough, indurated tissue, he decided to perform cœliotomy through the same external incision alongside of the tumor. Intra-abdominal palpation revealed the fact that the pelvic organs were perfectly free, and that the extension of the tumor upward along the line of the ureter was also absolutely free from adhesions with the viscera. Apparently the instrument had not passed through the uterus, but had been forced through the vaginal fornix, and had penetrated the retroperitoneal space. The original incision into the mass was now deepened for another half inch and he came upon a hard, cylindrical body, the bougie, lying perfectly free in a tube-like canal which it exactly fitted. On withdrawal, the instrument, which had lost its proximal capping and was therefore open, was found to be filled with a purulent fluid. The bougie was a No. 13 French, considerably the worse for wear. A rubber tube somewhat smaller than the bougie was inserted into the sinus for drainage, and the peritoneal wound closed by suture. Drainage was not satisfactory, and on December 19 the patient

was again anæsthetized and a counteropening in the loin made by cutting down upon a large-headed probe passed into the sinus. A viscus, thought to be the colon, was encountered, and had to be carefully incised in order to identify it. Finding it to be indeed the large intestine, the opening was closed by silk suture and counterdrainage by tube finally accomplished. The wound in the colon broke down, so that there was for a time a fæcal fistula, and the patient also passed through a severe tonsillitis and a lobar pneumonia. The drainage was efficient, however, and all wounds closed by February 15, the patient being discharged well after a stay of two and one-half months in the hospital.

#### CHOLECYSTECTOMY.

DR. F. KAMMERER presented a man, twenty-nine years old, who was perfectly well until a month before the operation. He then began to complain of severe pain in the epigastrium, with chills and vomiting. He had three similar attacks during the month, the last just before his admission to the hospital, this time associated with pain in the back and shoulder. Examination showed a large tumor over the site of the gall-bladder, with all the symptoms of an acute inflammatory condition.

The gall-bladder was exposed by Robson's incision. It was found much enlarged and filled with stones. The omentum was adherent to it, especially around its tip. At this point, after separation of the adhesions, which was easily accomplished, a patch of gangrene about the size of a silver quarter was found, and in the centre of this a perforation large enough to admit an ordinary lead-pencil.

The gall-bladder and part of the cystic duct completely filled with stones were removed. Recovery was uneventful.

DR. KAMMERER presented a second patient, a woman, fifty years old, who had had several attacks of biliary colic during the past two years. At the operation the gall-bladder was found filled with stones considerably thickened and tied down by numerous adhesions. It was freed with considerable difficulty, and extirpated. A search of the common duct was then made for further stones. Palpation of the deep ducts did not reveal the presence of further stones, and a probe was passed through the cystic and common ducts apparently without encountering any resistance.

The patient recovered from the operation, but a biliary fistula remained, all attempts to force the bile into the intestinal tract

failing. Upon reopening the abdomen several months later at least half a dozen stones were found in the common duct, which was slit open in its entire length. Just above the papilla there was a mass of inspissated bile about the size of a finger-nail.

After suturing the common duct, the stump of the cystic duct was opened and drained through the old wound. Unfortunately, the sutures in the common duct gave way, and for a long time there was a discharge of bile through the new incision. After four or five months both wounds finally closed.

Dr. Kammerer said that in this case the stones in the common duct were evidently overlooked at the first operation, in spite of a fairly thorough search and probing.

PRIMARY CHOLECYSTECTOMY: SCOPE, METHOD, AND RESULTS; CONCLUSIONS FROM FORTY-TWO CASES IN THE PRACTICE OF THE AUTHOR.

Dr. HOWARD LILIENTHAL read a paper with the above title, for which see page 44.

Dr. CHARLES L. GIBSON said it was scarcely four years ago when he presented the first case of primary cholecystectomy that had ever been shown at a meeting of this Society, and at that time Dr. Lilienthal rather opposed the operation. Since then, apparently, he had gone almost to the other extreme, and the tone of his paper was so optimistic that it gave one the impression that cholecystectomy was not only as safe, but safer than ordinary cholecystotomy. If that interpretation of Dr. Lilienthal's paper was correct, Dr. Gibson said he would take issue with him. He did not regard the actual removal of the gall-bladder as innocuous an operation, or less so, than one consisting of simple drainage of the gall-bladder. Theoretically, cholecystectomy possessed the advantage of removing the focus of infection, of doing away with the possibility of a mucous or biliary fistula, and of a recurrence of pain due to adhesions. A persistent fistula after cholecystectomy meant an incomplete operation.

Under certain conditions, Dr. Gibson said, the operation of cholecystectomy was certainly indicated, but it should not be undertaken unless some definite object was to be accomplished by it. Simple drainage of the biliary passages could be done perfectly well by cholecystectomy without opening the lower duct, by leaving the cystic duct open.

The reader of the paper mentioned hæmorrhagic diathesis as



a contraindication to the performance of cholecystectomy. While this was so theoretically, it would also apply to cholecystostomy. The speaker said he had seen two patients succumb to hæmorrhage after simple drainage operations on the gall-bladder.

DR. WILLY MEYER said that during the past twelve years, when he first took up gall-bladder surgery, he had done more cholecystostomies than cholecystectomies, and the results of the former operation, so far as a recurrence of the colicky pains, etc., was concerned, were extremely satisfactory. On two occasions he had opened the gall-bladder, taken out the stone, and immediately closed the wound. In both of those cases the patients got well, but the speaker said he did not favor the operation. At present he was also opposed to the performance of cholecystectomy in every case of gall-stones. He recalled two instances where the operation was followed by a recurrence of the colicky pains; there was no recurrence of the jaundice, but the pains were more severe than he had ever seen after cholecystostomy, and were attributed to the formation of adhesions. In every case, however, where the gall-bladder was thickened or materially changed in appearance, it ought to be removed. The speaker recalled a case where he had operated for acute empyema and did not add extirpation of the bladder on account of the patient's serious condition. Recovery was uneventful. Three months after the wound had definitely closed, a small, hard nodule was noticed in the scar, which at once impressed him as being malignant in character. A carcinoma of the abdominal wall developed, which evidently had begun in the wall of the gall-bladder. Patient was later operated by another surgeon and died soon after.

DR. KAMMERER said that during the past fourteen years, since the publication of Courvoisier's classical work, he had been operating on cases of cholelithiasis, and had never seen a case of recurrent gall-stones. When changes in the gall-bladder were found at operation, a primary cholecystectomy was indicated, as Dr. Meyer had already stated, because it was a well-established fact that patients with carcinoma of the gall-bladder generally had gall-stones. The macroscopic diagnosis of carcinomatous degeneration of the gall-bladder or of the ducts during operation was frequently impossible, and it was, therefore, better in such instances to remove the organ, when the appearance of the latter was not normal. Personally, the speaker said, he was opposed to primary cholecystectomy in every case.



DR. GEORGE E. BREWER said that Dr. Lilienthal, in his paper, did not advocate removal of the gall-bladder in every case of cholelithiasis, and the indications he gave for removal of the organ were very definite. Dr. Brewer said he would go even a step farther than the reader of the paper and advise the extirpation of every gall-bladder that had been rendered functionless, or the walls of which were thickened or changed in appearance, or one in which the cystic duct was obstructed. Another indication for removal of the gall-bladder was where a stone was found impacted in the pelvis of the organ, because mere removal of the stone in such a case usually resulted in absolute stricture. A gall-bladder containing purulent fluid should always be removed; otherwise, an infected cavity was left which would later cause trouble. Dr. Roswell Park had made the assertion that we should remove the gall-bladder as we would the appendix; that, like the latter organ, it was a relic, and of no particular use to the individual. Dr. Brewer said that where we had a gall-bladder which was not in direct connection with the duct system, or which was the seat of inflammation, it ought to be removed. If there were any indications for removal of the gall-bladder, it should be done at the primary operation. A secondary cholecystectomy was difficult, and the operation should be compared, in difficulty, to a secondary nephrectomy after suppurative disease of the kidney.

DR. JOHN B. WALKER said that he also had seen two fatal cases from persistent oozing after operation on the gall-bladder. The speaker agreed with Dr. Lilienthal that in those cases where the gall-bladder was in a gangrenous condition the cystic duct should *not* be closed.

DR. L. W. HOTCHKISS said that personally, in his work on the gall-bladder, he had been rather conservative in the choice of cases for removal of the gall-bladder. He spoke of the desirability, and necessity often, of draining through the cut cystic duct in certain acute cases, after cholecystectomy, and said that, instead of suturing it, he had clamped and cut it, and drained to the site with a rubber-tube drain submerged by a moderate gauze packing, and allowed it to heal by granulation.

DR. E. LIBMAN (by invitation) said that the usual impression was that bacteriæmia was very common in cases of gall-bladder disease and appendicitis. In his experience it did not occur very frequently. In appendicitis it must be very common. These observations were confirmed, he believed, by the fact that metastatic

dépôts in the joints, in the subcutaneous tissues, or in the viscera apart from the liver and lungs almost never occurred in such cases. It seemed that in some of the cases of disease of the appendix or liver the progress of the infectious process was stopped in the liver or in the lungs. And in some of these cases, while there might be bacteria in the blood current between the focus and the lungs, none were found in the peripheral circulation. Of course, in fatal cases, general ante-mortem invasion might occur.

To the cases in which bacteria were not found in the peripheral veins and the lungs were found to contain metastatic foci, Dr. Libman said he applied the term "non-systemic or partial bacteriæmia."

DR. LILIENTHAL, in closing, emphasized his belief that any gall-bladder that was bad enough to be operated on ought to be removed. Even in a case of uncomplicated cholelithiasis, with multiple stones, in which operative interference was demanded, a cholecystectomy was preferable to a cholecystostomy, and less dangerous and difficult than the latter operation. He saw no reason why such a gall-bladder should be allowed to remain and make trouble later on. If the gall-bladder was thickened and there were gross macroscopical changes, it certainly should be removed, because it was prone to become the seat of malignant degeneration.

In dealing with cases of cholelithiasis, one could never tell how long the stones had been in the gall-bladder, nor could the condition of the interior of the organ be determined by mere inspection of its exterior. Such a gall-bladder might possibly be gangrenous all the way through to the serosa, and this fact would never be disclosed by any operation short of cholecystectomy. That the mortality of the operation was low was shown by the fact that he had only had one death in forty-two cases, many of whom were in a very desperate condition at the time of operating, with high temperature, sepsis, etc.

Dr. Lilienthal said that all of his forty-two cases were not operated on through the rectus incision; only the last twenty-five or thirty were done by that method, which he regarded as very satisfactory. The incision could be made as long as was necessary, although he had usually found four inches long enough.

Dr. Lilienthal said that Dr. Kammerer's second case, in which a number of stones in the common duct were overlooked, was an extremely interesting one. In order to prevent the possibility of leaving stones behind, the speaker said he first put in a retraction

suture through the cystic duct underneath the clamp, and then, after dividing the duct, he tied off the cystic artery, which could be done very easily. With that danger of hæmorrhage out of the way, the operator could make a thorough search, and if there was any trouble afterwards, it was due either to the presence of adhesions, or to a re-formation of stones, or to something that could not have been avoided. It was certainly not due to the cholecystectomy. Although cholecystectomy was the most radical operation that could be done on the gall-bladder, he did not consider it any more dangerous than appendicectomy nor cholecystotomy. If the case was a simple one, neither operation was dangerous; while if it was a serious case, cholecystectomy was less dangerous than cholecystotomy.

In answer to the question whether he would leave the cystic duct untied in acute cases, Dr. Lilienthal said he thought that precaution would be unnecessary if the duct looked normal, without showing any evidence of gangrene, and if there was no cholangitis. If the latter condition was present, he would leave the duct untied. If the common duct was perfectly free, it furnished a natural and proper method of drainage into the bowel. If a good-sized probe could be passed through the cystic duct, there would be no necessity for slitting the common duct.

DR. CHARLES L. GIBSON related the history of a woman who was first operated on by another surgeon for empyema of the gall-bladder in 1901. She came under Dr. Gibson's care early in 1903, and was operated on by him on January 16 of that year. She then had a discharging sinus as the result of the previous operation. Upon excising the sinus and exposing the gall-bladder, the latter was removed and found to contain a gall-stone of considerable size and a small strip of iodoform gauze. The gauze was not in the gall-stone, but wrapped around it. The gall-stone in this case, Dr. Gibson said, had formed inside of two years.

#### INTESTINAL OBSTRUCTION FROM ADHESIONS DUE TO EMPYEMA OF GALL-BLADDER; SPONTANEOUS DISCHARGE OF THE SLOUGHING GALL-BLADDER.

DR. GIBSON presented a specimen taken from a woman of fifty-nine, who entered the hospital in September, 1903, complaining of symptoms of intestinal obstruction which had been present for four days. Some features of the case excited the suspicion of gall-stones. On opening the abdomen, the obstruction

was found to be due to an inflammatory mass composed of omentum and infiltrated intestine occupying the region of the descending colon. Upon inspection of the gall-bladder, it was found to be filled with pus and a number of large stones. These were removed and the gall-bladder drained. An artificial anus was made in the cæcum, and in the course of a few days the inflammatory condition in the region of the descending colon subsided, and ten days later the patient began to have some movement by the bowels. Her convalescence was interrupted by the onset of some acute illness, and it was four months before the artificial anus finally closed. Two weeks after the original operation, a sloughy mass presented in the wound, which was identified as the necrotic gall-bladder.

#### CHOLECYSTOTOMY.

DR. OTTO G. T. KILIANI presented specimens of gall-stones removed from a woman twenty-four years old, whose family and previous history presented no interesting features. Five months ago she began to complain of pain in the epigastrium, with vomiting, diarrhoea, jaundice, and chilly sensations. The jaundice persisted three days. These attacks recurred each month with increasing severity, the last one occurring two weeks ago. The stools during these attacks were lighter in color than usual.

Operation, February 24, 1904. A four-inch incision through the right rectus muscle revealed a normal looking gall-bladder. This was opened, and several stones of the mulberry type were removed. The gall-bladder was immediately closed with two layers of silk sutures. The abdominal wound was also closed, with the exception of a small gauze drain leading to the gall-bladder.

#### CHOLECYSTECTOMY.

DR. KILIANI presented specimens removed from a woman who, upon her admission to the German Hospital on March 2, 1904, was so sick that no history was obtainable. She was operated on the following day by Dr. Kiliani. The gall-bladder was found much thickened and enlarged, and about to perforate at its base. It was incised and two large and several small stones removed. Cholecystectomy was then done and the cystic duct closed with chromicized gut. The wound was drained to the stump of the cystic duct and the surface of the liver, where the gall-bladder had been adherent. The outer wound was closed, excepting for drainage.

TRANSACTIONS  
OF THE  
PHILADELPHIA ACADEMY OF SURGERY.

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*Stated Meeting, March 7, 1904.*

The President, HENRY R. WHARTON, M.D., in the Chair.

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THE ADVANTAGES OF ABDOMINAL OVER VAGINAL  
HYSTERECTOMY IN CARCINOMA.

DR. JOHN B. DEAVER said that he saw a large number of cases of uterine carcinoma each year, many of which have passed beyond the stage for operation. Unfortunately, many of the subjects of this disease suffer from symptoms not at all well defined, are free from pain, and have but little discharge until the growth has become so extensive as to forbid radical interference; for this reason the family doctor is often unaware of the real nature of the disease until it is too late to resort to surgical interference.

Irregular bleedings from the uterus, whether before, during, or after the menopause, should excite the apprehension of the general practitioner, as well as the surgeon, to investigate, at any rate. It is absurd to consider feelings of delicacy and allow them to prevent an inspection of the cervix and palpation of the body of the uterus, nor in doubtful cases fear of consequences deter resort to curettage with examination of the scrapings. Negative findings by the pathologist should be accepted with great reserve and not be allowed to controvert unmistakable clinical symptoms, especially in women approaching or past the menopause. He emphasized the latter, because, as is well known, epithelioma rarely begins until after the child-bearing period.

The differentiation between hæmorrhagic endometritis and commencing malignant disease is not always possible; in fact, it

is the practice of the writer, in those cases of hæmorrhagic endometritis occurring about the change of life with a large and flabby uterus and family history of malignancy, to make a complete removal of the uterus.

In hæmorrhagic or hypertrophic endometritis with foul-smelling discharge, the uterus should be curetted and the findings examined microscopically. A negative finding does not necessarily prove the absence of carcinoma, as the curette may have escaped the cancer area, or the carcinoma be within the uterine muscle. Excision of a small portion of the uterine tissue for microscopical examination can only be considered where the disease is of the cervix.

The class of cases of carcinoma of the uterus which perplex the surgeon most in determining what is best to do are those which are not seen early; when it is questionable whether the tissues outside the uterus are involved, rendering it difficult to determine even the propriety of radical interference. The most common site of carcinoma of the uterus is the cervix, which is usually squamous-celled, and early in the disease is essentially a local process, hard and indurated, with papillæ elevated from the surface of the mucous membrane. These papillæ increase and enlarge, giving rise to the cauliflower-like growth so often seen; ulceration and necrosis soon follow, implicating the vaginal vault, the broad ligaments, the bladder, and rectum. When the case has assumed this stage radical treatment is, as a matter of course, not to be considered. One of the important questions to be decided in the operation for radical cure of carcinoma, be it situated in the uterus or elsewhere, is, Can the excision of the cancer area be performed by section through normal tissue?

For the relief of the discharge, the bleeding, or the pain in advanced carcinoma of the uterus, local measures, as the curette and cautery, are more efficacious than the use of the knife. The most careful bimanual examination must be made to determine the advisability of radical operation, also must the patient's general condition and the absence of other organic lesion be favorable. The radical operation is, in the speaker's judgment, only to be considered in the early stages of the disease. He had found that the pain consequent upon the recurrence of carcinoma following late and extensive operation is greater than in cases of the kind which have been curetted and cauterized.



The speaker practises and strongly advocates total ablation of the uterus by the abdominal route in early carcinoma of the cervix. He felt sure this operation promised more, both immediately and ultimately, than does the removal by the vaginal route. In the early stages complete removal of the uterus, broad ligaments, and the lymph channels in the latter, with possibly the iliac lymph glands in some cases, should guard against recurrence with reasonable security.

It is interesting to note that Professor Jacobs, of Brussels, one of the earliest advocates of vaginal hysterectomy for cancer of the uterus, has entirely changed his views, and now only does the vaginal operation when the abdominal route is impracticable. Jacobs states that he never has had a case of uterine cancer operated upon by the vaginal route to live more than three years, and that the majority of them were dead at the end of one year. In contrast to this he has a number of cases, upon which he operated by the abdominal route, that are living and well after four years. Jacobs practises the removal of the pelvic glands.

Professor von Rosthorn, of Heidelberg, also practises cleaning out of the glands of the pelvis in carcinoma of the uterus; in fact, this is the common practice at the present time on the Continent. It would seem as reasonable to remove the glands of the pelvis in connection with removal of the uterus in early carcinoma as it does to remove the glands of the armpit in early operation for the removal of cancer of the mammary gland. It scarcely seems necessary to say that this is a useless procedure where there is already systemic involvement. The Halsted operation for carcinoma of the mammary gland, as practised by Dr. Deaver, is only done in the early cases. It is useless to make so extensive a dissection after there is advanced involvement of the axillary, subclavian, and supraclavicular glands. When the latter condition is present, it is evident that the disease has advanced beyond the reach of the surgeon's knife, particularly in the shape of involvement of the intrathoracic glands.

He strongly opposed vaginal hysterectomy in carcinoma of the cervix, except in the presence of obstacles necessitating such a course, for instance, a very stout abdomen, nephritis, etc. Early carcinoma of the fundus of the uterus is the condition in which he practised vaginal hysterectomy, and not in the cases where sufficient time has elapsed to have allowed the lymphatics of the cervix uteri to have become involved.



The vaginal operation in carcinoma of the cervix offers no advantages over abdominal section when the latter is properly performed, and suffers from the charge of being an incomplete procedure, dangerous to the ureters, and liable at any time to be followed by secondary bleeding. The abdominal operation certainly gives the only chance for the proper cleaning of the pelvis, offers greater security against hæmorrhage and less risk of injuring the ureters; the field of operation is kept constantly in view, the patient in the Trendelenburg position, and the intestines kept out of the way of injury and infection by the proper placing of gauze pads. That we can cut farther away from the diseased area in the abdominal than in the vaginal operation, we must admit.

In the abdominal operation, he never had any fear of injuring the ureters if the bladder with the anterior serous flap was carried well forward and upward behind the pubic bone. If the operator is not content with this, it is a simple matter to expose the ureters. The introduction of ureteral catheters or bougies to safeguard the ureters had not been his practice. He had always feared more the consequences of carrying an instrument from the bladder into the ureters and exposing the kidneys and ureters to the danger of infection than injury to the ducts.

He was an advocate of dissection of the lymphatic glands of the pelvis in all cases of carcinoma. He did believe, however, that in certain selected cases this operation is not only feasible, but in order. In this connection he furthermore said that the dissection of the pelvis should be done as readily, the conditions requiring it, as a deep dissection of the neck; the same amount of care in exposing the lesion and the structures in relation therewith, thus avoiding unnecessary mutilation, should be carried out in the same anatomical manner as in the dissection for the removal of an enlarged thyroid gland. This being done, fewer ureters will be injured, fewer cases of secondary hæmorrhage, of postoperative vesical fistula, intestinal fistula, etc., will have to be noted. The individual ligation of vessels of any size as opposed to the mass ligature or the use of that abominable instrument, the angeiotribe, be it the plain or electrical hæmostatic instrument, he strongly urged.

In connection with the discussion of the propriety of the removal of the pelvic lymph glands, it is interesting to note that

the lymphatic system of the uterus is composed of a rich network of vessels, those from the vagina and lower portion of the cervix following the uterine vessels to glands at the bifurcation of the common iliac arteries, usually three in number, whence they pass upward. The lymphatics of the body of the uterus anastomose with those of the cervix uteri, travel downward to the deep inguinal glands by way of the round ligaments, and pass through the utero-ovarian ligament, emptying into the lumbar glands. Notwithstanding these abundant lymphatics, carcinoma of the uterus spreads more rapidly by continuity of tissue than through lymphatic metastasis; therefore, the argument in favor of removal of the pelvic glands is weakened. Certainly the only cases that promise anything are those where the glands have not yet become involved. Experience teaches that extension of the cancer downward into the vagina and backward into the rectum is much more common than metastasis into the pelvic glands.

Epithelioma of the vagina has been overlooked as a point of metastasis or implantation, the diseased area resembling so much an excoriation and has been mistaken for such, believed to have occurred in preparation for operation. Early involvement of the bladder may be recognized only by means of a cystoscopic examination.

The technique of the abdominal operation is comparatively simple. The abdomen opened through the right rectus muscle, the contents of the pelvic cavity palpated to determine the presence of adhesions, and if the disease has extended beyond the uterus, the patient is placed in the Trendelenburg position, the intestines and great omentum are protected by gauze pads carefully placed. With the gauze pads properly placed the field of operation in the pelvic cavity is well exposed. Traction is now made upon the fundus of the uterus, drawing it upward and backward, when an incision is carried from the pelvic end of one round ligament to that of the other, and through the serous covering of the anterior surface of the uterus at the point of reflexion of the peritoneum from the uterus on to the bladder. This serous flap is displaced downward, carrying the bladder with it; the dissection is carried as far down as possible, in this wise displacing the bladder upward behind the pelvic bone, thus exposing the anterior wall of the vagina and carrying the ureters out of harm's way. The next step in the operation is tying off the ovarian arteries to the outer or

inner side of the ovary or ovaries, depending upon the advisability of removing or leaving them. It is his practice to leave the ovaries in cases of carcinoma occurring in early life. The uterine arteries and veins are next exposed as they pass from the side of the pelvis to the cervix uteri and tied between two ligatures and divided; in making the dissection to expose these vessels the ureters are exposed, and thus rendered less liable to injury. The next step in the operation is cutting the cervix out of the vagina with the removal of the organ. The vaginal walls are now whipped over with a continuous catgut suture, a piece of iodoform gauze placed in the vagina allowing a small portion of it to protrude into the pelvis, when the anterior serous flap is brought over the protruding gauze and stitched to the posterior surface of the vaginal wall or the serous covering of the sigmoid flexure, as the case may be. The gauze pads removed; the intestines and great omentum placed in normal position; the abdominal walls closed with tier suture; the abdominal wound dressed and an aseptic dressing applied to the vulva, and the patient returned to bed. The head of the bed is elevated, unless there are symptoms of temporary shock, when this is not done until the patient has recovered from shock.

In making a vaginal hysterectomy, he preferred to use clamps rather than ligatures.

DR. WILLIAM J. TAYLOR said he agreed in every particular with the statements made by Dr. Deaver. He had performed his last vaginal hysterectomy. In the last patient upon whom he did this operation, for a malignant growth of the uterus, it was followed by infection, with a resulting peritonitis. The peritonitis was followed by embolism and dry gangrene in the right forearm that necessitated amputation above the elbow. The patient left the hospital minus not only her uterus but also her right forearm; this result occurring in spite of the fact that all possible care was used in the operation. It decided Dr. Taylor against further use of the vaginal method.

DR. DEAVER said that Dr. Taylor was fortunate in that his patient did not lose her life. His brother had an experience with a similar condition, but his patient died. She was a large, stout woman, and during the operation her limbs were held by assistants. They did what residents are prone to do,—use the limbs as a hammock and go to sleep,—and as a result of the excessive flexion during a long operation thrombosis, gangrene, and death occurred. The case demonstrated that assistants should be awake.

## LOOSE BODY REMOVED FROM THE KNEE-JOINT.

DR. HENRY R. WHARTON reported the case of a man, aged fifty years, who was admitted to the Presbyterian Hospital January 19, 1903, with the following history: Early in November he wrenched his right knee, but, although the knee gave him some pain, he was able to continue his work. Shortly after the accident he began to suffer with occasional pain and disability in the right knee, and experienced a sensation as if something had slipped out of the joint upon certain motions of the joint. In December the symptoms became aggravated, so that at times when walking the body slipped out of the joint, produced intense pain, and caused the knee to give away under him, so that he would fall. He became so uncertain in his movements that he was compelled to give up his work. There would often be intervals of several days when he suffered from no displacement of the body.

After his admission to the hospital, upon certain movements of the joint he was able to bring the body out of the joint, so that it could be located, when the joint was flexed, near the inner edge of the patella.

After the body had been located, it was fixed by a needle passed into it through the skin, and a firm compress was also applied above it to prevent its slipping back into the joint. The patient was then anæsthetized and an incision made through the skin over the body, and it was removed. It proved to be a bony body, convex upon one surface, partially covered with cartilage, and about the size of a Lima bean. The wound was closed by two layers of sutures, and the joint fixed by a plaster-of-Paris bandage. The superficial sutures were removed upon the tenth day, and the wound was found healed.

The etiology of loose or movable bodies in the knee-joint is not definitely settled. Their presence is attributed by various authorities to detached synovial fringes, which remain free in the joint; or to detached osteophytes; or to the detachment of portions of bone or cartilage from a wrench or twist of the joint; or the detachment of a portion of the articular surface of the bone or cartilage by a quiet necrosis without suppuration. Fibrous bodies are said to frequently result from the organization of blood-clots following injury of the joint. The body may be entirely loose, or attached by a long or short pedicle. The bodies vary in size from a pea to a body an inch or more in diameter, and may be carti-

laminous, fibrous, or bony in structure. The symptoms vary in intensity, and may disappear at intervals, and appear to be due to quiescence or mobility of the body. Fixation of the joint occurs at intervals, as the body occupies certain positions in the joint. Nausea when the body becomes displaced is not an uncommon symptom in many cases. The presence of the body sooner or later causes disability and weakness of the joint from chronic synovitis, with stretching of the ligaments.

The most satisfactory treatment of this affection is the removal of the body by incision. It is wise, however, not to attempt to remove the body unless it can be definitely located, as it may be difficult to find even after an extensive exposure of the knee-joint. The operation, with careful aseptic details, is accompanied by little risk.

DR. JOHN B. ROBERTS said that he once undertook to remove what was thought to be a movable body from the knee-joint and was surprised to find that it was an osteoma or osteophyte on the femur. The fascia slipping over this gave the sensation of a movable body. The treatment for both conditions being the same,—removal,—the mistake in diagnosis was not of importance.

DR. JAMES K. YOUNG mentioned two cases that he recently had seen. One, under the care of Dr. Willard, was in an athlete from whose knee the loose body was taken out in two pieces, the tissue being cartilage. The second case, under his own care, is in a woman of fifty years. In this instance the movable body, which is larger than those usually found, is situated above and internal to the patella. The patient has not as yet been operated upon.

DR. W. BARTON HOPKINS said that he had seen in the laboratory of the Pennsylvania Hospital several loose bodies that recently had been taken from the knee-joints of an aged colored man who died in the medical ward of that institution. The largest concretion measured  $6\frac{1}{2}$  by  $4\frac{1}{2}$  by  $2\frac{1}{2}$  centimetres and weighed fifty-five grammes. The two smaller concretions in the right knee-joint were not measured or weighed. It was mainly fibrocartilage, but had a small bony nucleus.

DR. GEORGE G. ROSS mentioned a case which illustrated a point made by Dr. Wharton regarding the difficulty of securing a loose body that has not been accurately located or anchored before opening the joint. In this instance the body could not be found until the finger was introduced and the joint explored. Fortunately, infection did not follow this manipulation.

## FRACTURE OF SPINE, ACCOMPANIED BY AN ENORMOUS PROSTATIC CALCULUS WITH PYONEPHROSIS, AND FINALLY A GUNSHOT FRACTURE OF THE SKULL.

DR. W. BARTON HOPKINS presented the following outline of the history of this case:

M. S., aged twenty-eight years (?), born in Germany; was admitted to the late Dr. J. M. Da Costa's ward in Pennsylvania Hospital, January 6, 1899, with pneumonia. The evening of his admission he became wildly delirious, requiring restraint in bed. Later on he succeeded in slipping his straps, jumped out of the window, and fell upon the grass, a distance of fifteen feet.

On being brought back into the hospital he was found to have sustained a fracture of the lower dorsal or upper lumbar vertebra, accompanied by complete paralysis from the waist down. The shock of the injury in conjunction with his serious illness rendered his condition desperate. Note of the physical signs of his chest showed pneumonia of the right lung. His breathing was rapid and shallow and he was much shocked. He slowly reacted, and at the end of a week his general condition having improved, Buck's extension apparatus was applied to both legs and counter-extension to the head; but a fortnight later, there being no benefit from the latter, it was removed.

In six months his general condition had very much improved, but the paralysis remained unchanged.

Having had occasional attacks of hæmaturia, the presence of vesical calculus was detected about this time. From then on the urine contained blood and pus, varying in quantity but always present. About this time (1901) the patient was able to sit up in a wheel-chair, thus relieving the pressure over the bed-sores which were present. His flesh was good and he was strong and able in his upper extremities. A pair of adjustable crutches was applied to the chair so that he could elevate and lower them, and thus take more or less weight off of his buttocks. In this way not only were the bed-sores made to heal, but his ability was much increased to wheel himself out of doors, and thus obtain exercise and fresh air.

His mental state was generally quiet and contented. The stone which was thought to be vesical, but proved post-mortem to be prostatic, had increased enormously in size, and the urine contained large quantities of pus, but he obstinately declined to be relieved by operation.



January 26, 1904, his stomach gave out, and this apparently being the last straw, he became hopelessly despondent, and four days later, obtaining a pistol, shot himself in the right temple and died in about ten minutes.

An autopsy was made January 30, 1904, by Dr. Longcope, who has furnished the following notes:

The body is that of a young man 163 centimetres in length. Rigor mortis absent. Body still warm. There is very slight post-mortem discoloration over back and shoulders. Pupils equal and dilated. The upper extremities, neck, and thorax show a moderate grade of muscular development. Below the umbilicus there is extreme emaciation of all the muscles. The pelvis and lower extremities are almost literally skin and bones. The abdomen is scaphoid, and the anterior superior spines of ilium stand up prominently. The circumference of the middle portion of right thigh is seventeen centimetres; on the left side it is seventeen and one-half centimetres; about the middle portion of right tibia, fifteen and one-half, and left, fifteen centimetres. The feet are in talipes equinovarus position. There is no œdema of lower extremities. Penis is small. There is a narrow band covered with skin which goes from prepuce to glans on dorsal aspect of penis. Over the tuber ischii there are purple splotches, and over the sacrum the skin in places shows shallow ulcerations.

In the right temporal region, six centimetres above the zygoma and in a line with the middle of this bone, the hair for an area of two and one-half centimetres across is matted with blood. Around the margin the hair is singed. The tip of the ear is blackened, and there are black marks at the outside of the supraorbital ridge. In the centre of the area where the hair is clotted with blood a small, ragged, round hole one-half a centimetre in diameter is found in the scalp.

Muscles are pale.

Abdominal Cavity. The omentum is pale, delicate, and has very little fat, but covers the intestinal surfaces well. Peritoneal surfaces are smooth and glistening. Appendix measures twelve centimetres in length, lies behind the cæcum, and is patent throughout.

Thorax. Lungs collapse upon removal of sternum. On left side the lung is bound down to thoracic wall by old fibrous cobweb adhesions. On the right side the pleural cavity is free from fluid



and adhesions. Pericardial cavity contains a small amount of clear, straw-colored fluid; serous surfaces are everywhere smooth and glistening.

Heart. Weight, 200 grammes. The heart is of medium size; epicardium everywhere smooth and glistening and contains some fat. The right side is distended with firm red and white post-mortem clots. All the valves are thin, delicate, and normal. The endocardium is slightly thickened over left ventricle. The heart muscle is firm and brownish gray in color. Left ventricular wall averages from ten to fifteen millimetres in thickness. The aorta shows some slight sclerosis. Walls of coronary arteries are thickened, but the arteries are patulous.

Lungs. The left lung is rather small, soft, and crepitant throughout. The surface is dark purplish blue mottled with black. On section, the cut surface is everywhere pale pink, soft, and crepitant. Bronchi at the root contain a small amount of mucus. Vessels are clear. The posterior part of pleura is covered with old fibrous adhesions.

The right lung is exactly like the left, the pleura being everywhere smooth and glistening.

Spleen. Weight, 190 grammes. Size, 13 by 8 by 5 centimetres. The capsule is delicate, smooth, and free from adhesions. The color is dark purplish brown. Consistency not decreased. On section, the cut surface is smooth, somewhat mottled brown, and red. Malpighian bodies are of medium size. Trabeculae are not increased.

Liver. Weight, 1220 grammes. Size, 21 by 17 by 9 centimetres. The liver is rather small, not increased in consistency, regular, smooth, and dark purplish brown in color. The capsule is free from adhesions. On section, the cut surface is smooth and brownish in color. Lobules are fairly well marked, their centres are small and reddish. Portal connective tissue not increased. Bile ducts patent. Gall-bladder apparently normal.

Urinary bladder, ureters, and kidneys removed together. While the bladder is being removed, a large concretion escapes from the prostatic portion of urethra which has been cut through. On opening the urethra and bladder the solid portion of prostate has entirely disappeared; instead of a gland there is a large, thin-walled sac which contained the concretion, and apparently surrounded it completely.

The stone is rather soft and crumbling.

It is quite regular in shape and looks as if moulded into the form of a large prostate. It is divided into three or four more or less well-defined lobes and presents a general heart shape, the apex pointing towards the neck of the bladder. On the under surface there is a rounded depression about one centimetre in diameter, into which fits the verumontanum. At the base the stone measures six centimetres in diameter, at apex, three centimetres. It is six centimetres in length and four and one-half centimetres in thickness at the base. At the anterior portion of base there is a rounded mass about two centimetres in diameter. This ends in a round process with a broken end. This process is apparently a cast of the membranous urethra. A second tip-like process extends from the superior lobule into the neck of the bladder. The wall of the sac containing the concretion is gray in color, and is covered with much pus and some mucus. The verumontanum is about the size of a cherry-stone. The ducts leading into the seminal vesicles are patent. Neck of bladder rather small. On opening the bladder the cavity is small, and is entirely filled with a thick, stringy, yellow pus having a rather foul odor. A few masses of calcareous material are also found.

The wall of the bladder is much thickened and the organ is very small; wall measures in places one and one-half centimetres in thickness. The mucous membrane is corrugated, thickened, and red in color. There are some adhesions about the seminal vesicle. Both ureters are distended to the size of one's thumb, and on pressure the ureteral orifices, which are difficult to find, are marked by a spurt of yellowish pus. The intravesicular portion of both ureters is very small and shows some actual constriction, for it is difficult to get even a small probe through the orifice. When the ureters are opened the stricture in the bladder wall is very noticeable, above this the ureters are dilated into tubes about two and one-half centimetres in circumference. The wall is thickened and the mucous membrane is very much reddened. Both ureters contain thick yellow pus. The dilatation continues up to and into the pelves of the kidneys.

The left kidney measures  $13\frac{1}{2}$  by 7 by  $5\frac{1}{2}$  centimetres. The kidney is very large and very soft, having almost a fluctuating feel. It is somewhat irregular in shape. The capsule strips readily,

leaving a fairly smooth but lobulated surface, which is mottled purple red and gray.

It is dotted with irregular opaque yellow points and areas which measure from one to ten millimetres in diameter. The largest ones are quite soft. On section, the pelvis and many of the calyces are enormously dilated, and all are filled with stringy yellow pus. At times the dilated spaces reach within one and one-half centimetres of the surface, in which event the kidney substance appears as a gray or red line destitute of normal markings and dotted with yellow points. In other places the cortex and medulla vary from one to three centimetres in thickness. In these portions the medullary pyramids are swollen, reddish, and ill defined from the cortex. The cortex is very irregular; it measures from five to ten millimetres in thickness. Sometimes the triæ are fairly well marked and the glomeruli stand out as red points. In these areas the cortex has a general red look. In other places the markings of the cortex are lost, and the kidney shows extreme red and yellow mottling, while opaque, yellow streaks extend from the medullary pyramids into the cortex. The wall of the pelvis and calyces are much thickened, reddened, and in places covered with soft yellow material.

The right kidney measures 13 by 12 by  $5\frac{1}{2}$  centimetres. It is much softer than the left, has a more nodular appearance, and feels much like a thick-walled cyst. The surface is paler, and shows many more of the soft yellow areas. On section the pelvis and calyces are so much dilated that very little of the kidney substance remains, and almost none that retains its normal markings.

Many of the calyces end in abscesses, the wall of which reaches within two or three millimetres of the surface and is covered with thick, tenacious, yellow pus. Adrenals are apparently normal. Pancreas, stomach, and œsophagus apparently normal. Intestines are apparently normal.

Aorta fairly smooth.

Testes are apparently normal but rather soft.

The spine from the sacrum to the fourth cervical vertebra is removed *en masse*. At the level of the twelfth dorsal or first lumbar vertebra there is a slight deformity. The body of the last dorsal vertebra is small and compressed, and the spine curves somewhat forward and to the left side. Over the lamina there are bony exostoses which fill almost entirely the space between the

spinous processes and lateral processes. On sawing through the laminæ and exposing the cord it is seen to be rather small, except just beneath the deformity, where there is a hard, irregular swelling about the size of one's thumb-nail. Here the dura mater is adherent to the bony canal.

Brain. The skull immediately beneath the wound in the scalp shows a ragged round opening two centimetres in diameter. On the inner surface of the temporal bone the inner table is somewhat torn. There is extensive hæmorrhage beneath the dura mater and also beneath the pia mater in places. Corresponding to the hole in the scalp and dura beneath it there is a large tear in the substance of the brain which involves the fissure of Sylvius about four centimetres anterior to the foot of the fissure of Rolando. About it there is an extensive hæmorrhage beneath the pia mater. In the superficial portion of the laceration, a piece of bone two centimetres in length, one centimetre in width, and one-half centimetre in thickness together with a small mass of lead is found. On the median surface of cerebrum a second laceration is found midway between the fornix and the surface of cortex and five centimetres back of anterior point of fornix. The falx cerebri is perforated by an opening one centimetre in diameter, the perforation corresponding exactly with the situation of the laceration in cerebrum. The left hemisphere shows two lacerations, one on the inner surface and the other on the cortex; they are only two and one-half centimetres apart. Embedded in the brain substance on left side just below the pia mater there is a small piece of lead; it lies in the foot of the postcentral lobe one and one-half centimetres above the fissure of Sylvius.

Anatomical Diagnosis. Double pyelonephrosis; chronic cystitis; calculus of prostatic urethra; old fracture of last dorsal and first lumbar vertebræ; laceration of brain by a leaden bullet.

DR. JOHN B. ROBERTS described briefly a similar case upon which he recently had operated. The patient had attempted suicide and was unconscious when seen. Marked exophthalmos was present; it being readily surmised that the bullet had passed just behind the orbits and that the cavities were probably filled with blood. The skull was trephined at the point of entrance of the bullet and fragments of bone and a great deal of blood were removed. On the opposite side of the head was an increasing swelling of the scalp, which, when opened, showed that the bone was

broken but not perforated by the bullet which had passed through the brain. The bullet had caromed and was found in the brain one and one-half inches posterior and below the wound in the skull. The patient had lost a great deal of blood and soon afterwards died.

#### PULMONARY COMPLICATIONS FOLLOWING ABDOMINAL OPERATIONS.

DR. R. P. McREYNOLDS said that in looking over a series of 100 cœliotomies in order to determine the frequency of postoperative pulmonary complications, he had found two cases of bronchopneumonia, one of bronchitis, one of abscess of lungs, and three of pleurisy. The case of bronchitis followed an operation for mistaken perforation of a typhoid fever ulcer, and may possibly have been due more to the fever than to the operation. It was of short duration, and the patient made an uneventful recovery from the bronchitis, the typhoid fever, and the operation. The cases of pleurisy have been of the simple plastic variety, and were easily cured by strapping the affected side with adhesive plaster. He gave brief histories of the other cases:

CASE I. (*Bronchopneumonia following Hysterectomy for Uterine Fibroid.*)—Operation, August 12, 1902; ether anæsthesia. Mrs. P., aged thirty-five years, sought relief from pain and hæmorrhage caused by a small uterine fibroid. He hesitated to do a radical operation upon her because of a tubercular family history and an undoubted latent tubercular foci in her own lungs. An attempt was made to relieve her by dilating and curetting the uterus, but this was a complete failure, and one year later he was forced to do a hysterectomy. The day following the operation she began to cough and temperature suddenly went up to  $101\frac{2}{5}^{\circ}$  F.; during the next three days there gradually developed a typical bronchopneumonia of left lung. Frequent examinations of the sputum failed to demonstrate the presence of tubercular bacilli. She made a slow recovery, and left the hospital still suffering from a slight hacking cough. Sixteen months after the operation she died from pulmonary tuberculosis. There were no abdominal complications throughout. The ether and the Trendelenburg position were probably the cause of the pneumonia.

CASE II. (*Bronchopneumonia following Double Salpingo-*

*oöphorectomy for Bilateral Tubo-ovarian Abscess.*)—Operation, November 28, 1903; ether anæsthesia. Glass drainage.

The temperature began to go up immediately after the operation, and the following day it was 103° F., and there were present the physical signs of bronchopneumonia of right lung. The coughing caused the through-and-through abdominal stitches to cut out, which retarded her convalescence somewhat. She, however, made a good recovery and is perfectly well to-day. The patient had developed a slight cough (which had been overlooked) the day before the operation. The pneumonia resulted probably from the inspiration of some foreign substance into the lungs at a time when their resisting forces were impaired.

CASE III. (*Opening and Draining Abdominal Abscess caused by Perforation of Typhoid Fever Ulcer.*)—Operation, March 23, 1902; Chloroform anæsthesia. The convalescence in this case was normal up to the second week, when he developed a slight cough, and a little later there were present physical signs of consolidation of right base. Frequent punctures with aspiration-needle into the pleural cavity and the lung substance itself failed to locate the pus, which finally ruptured into a bronchial tube and was coughed and spit up. He made a tedious but perfect recovery and is strong and well to-day. No abdominal complications throughout, wound granulated and healed normally.

The numerous lymphatics running along the psoas muscle enable the infection to travel upward towards the diaphragm; it is then conveyed to the lungs through the blood current and there forms a foci of infection, around which an abscess gradually develops (metastatic pneumonia).

In these cases were illustrated the most frequent causes of postoperative pneumonia, *i.e.*, the irritating effect of ether itself; the inspiration of foreign substances during etherization; septic emboli.

Other causes are, exposure and wetting during an operation; prolonged use of Trendelenburg position and the forced retention of the intestines upon the diaphragm; intravenous injection of normal salt solution.

To prevent chilling during the operation the electric pad laid over the operating table has been recommended. It is theoretically all right, but practically it is worse than useless, and he mentioned it in order to condemn its use. In prolonged abdominal operations



upon patients who are very weak and debilitated, pulmonary complications can to a certain extent be prevented by having the extremities and the chest covered with cotton during the operation.

The best way to prevent the patient from becoming wet is to use as little water as possible during the operation.

Dr. Körte, of Berlin, has a technique which he had copied and found most satisfactory. The hands after being sterilized are wiped dry, and this is repeated after each washing during the operation. The instruments after boiling in soda solution are dried and placed upon a sterile sheet spread over a glass top table. After using an instrument it is taken by a nurse, washed in hot soda solution, dried and placed back upon the table,—another nurse, wearing sterile dry gloves, threads the needles, hands the instruments, etc.

The indiscriminate use of intravenous injection of normal salt solution is capable of producing serious and even fatal cardiac and pulmonary complications. It is a very nice little operation itself and should not be intrusted to one who has not had some surgical experience. One must always bear in mind the possibility of causing an embolism from the introduction of air into the veins during the administration of the solution. When the lungs are congested from the irritating effects of the ether or from any cause whatever, and the right heart is already embarrassed, the sudden introduction into the circulation of a large quantity of fluid may cause complete cardiac failure, or further embarrass the heart, and so aggravate the existing congestion of the lungs. This is especially apt to occur when the patient is in the Trendelenburg position and the intestines are pushed and held up against the diaphragm, thereby preventing the normal downward expansion of the lungs.

A large number of patients requiring abdominal operations have been ill for years, and during this time their bodies have become more or less worn and emaciated. The heart and lungs have adapted themselves to the change and are no longer capable of responding to a sudden call for extra work. If in these cases there is the one indication for intravenous injection of salt solution during an abdominal operation, *i.e.*, loss of blood, it should be given slowly, and the temperature of the solution not allowed to drop from 110° F. during the administration.

DR. JOHN B. ROBERTS said that patients get pulmonary complications after operation as a result of oversight in their care. In



some instances it is a question of too much ether and too little undershirt. It is the common failing of hospital residents to give too little ether at first, when a great deal is needed, and too much afterwards. When patients are overloaded with ether, particularly if in the Trendelenburg position, it is little wonder that they contract pulmonary congestion, pleurisy, and pneumonia. It is the practice in many hospitals to take off the underclothing of new patients and give them only a night-shirt of thin muslin that is open in the back. The patient is then operated upon, given too much ether during the operation, and afterwards taken to a ward where the beds are placed with the head towards and under the window. Such practice is responsible for some cases of pulmonary complication. Too little thought is given to the care of the patient before and after operation. It is customary to combat these shock-producing agencies by infusing saline solution. The practice of putting salt solution into a vein at the bend of the elbow is becoming entirely too much of a fashion among hospital residents.

DR. JOSEPH SPELLISSY, apropos of the reference of Dr. McReynolds to the unsatisfactory results from the use of the electric pad during operations, said that one had been used at the University Hospital, in the service of Dr. Willard, during the past five years. The appliance has given a great deal of comfort and is efficient in keeping the patient warm. No burn of a case has occurred, and many patients have undoubtedly been much benefited by its employment.

DR. RICHARD H. HARTE referred to the scrupulous care exercised by the late Dr. Ashhurst in keeping his patients covered during and after operation as an effective means of preventing complications. Certain surgeons in the West are reported as having ceased to employ ether anæsthesia because of the frequency with which it is followed by pneumonia. That such results can be attributed to ether is not borne out by his own experience, as he does not lose cases from postoperative pneumonia. He is very careful to keep his patients covered, and this unquestionably has its effect in preventing complications. Hospital residents are often careless in such matters, and the routine of admission in many hospitals is to take off the patient's flannels, bathe him, and put on him a thin muslin shirt. This cannot help but cause a tendency to take cold. Patients will not get pneumonia if they are carefully looked after before, during, and after operation. The intravenous

injection of salt solution is a very good thing in many instances, but its use is at times abused.

DR. JOHN B. DEAVER concurred with the statements of Drs. Roberts and Harte. Regarding the shirts worn by hospital patients, he fought out that question years ago, and now it is a standing rule in the German Hospital that every patient dons a flannel shirt, and wears it to the operating room if operated upon. Dr. Deaver has never used the electric mattress, but employs the hot-water bed for all cases of operation upon the upper abdomen, as gall-bladder and stomach cases. Burns from this appliance will not occur if reasonable care be used. In the classes of cases mentioned, the arms, chest, and lower extremities are before operation enveloped in cotton and bandaged. With all these precautions, pneumonia may develop. Often too much ether is given. He watches the anæsthetizer. He is often asked how he manages to do this, but it is part of a surgeon's duty. Everybody in the operating room should be watched. Dr. Deaver never allows the use of any anæsthetic but straight ether, opposing the use of nitrous oxide, and other combinations, to the extreme. There is one trouble with many trained nurses, and that is that they kill people with fresh air; opening windows in the operating or recovery room may easily cause a fatal complication. Saline infusion has its place, but only trained house physicians should be allowed to use it. Air will not enter the vein if proper precautions are observed. Infusions are seldom called for except in cases of hæmorrhage. As to the statement made regarding dry hands and instruments, dry surgery is preferable to wet surgery in every instance. Shock comes from prolonged operations. It is no wonder that patients die after hysterectomy lasting two hours or longer; when fifteen to thirty minutes should suffice, as a rule. The patient is necessarily overetherized in long operations. The hot-water bed is not used to prevent shock but to prevent complications in the thoracic cavity. We hear much about shock from loss of blood, but unnecessary manipulation of the abdominal contents is a more fruitful source. In answer to a question of Dr. Taylor as to whether his patients had backache after being on the hot-water bed, and if he attributed this to the heat or to the surface of the bed fitting the inequalities of the patient's body, Dr. Deaver said that nearly all his patients complained of backache after abdominal operations, but he had never thought of the bed as being the cause.

DR. JAMES K. YOUNG endorsed what had been said in favor of the electric mattress. No shock has occurred among the children operated upon in the University Hospital since it has been used. Prior to its use, four children were severely shocked, apparently from cold during operations. Recently, while performing a double astragalectomy in another hospital, the lack of the mattress was forgotten for the time, and the patient became severely shocked, although the etherizer reported his condition good after one side had been completed. No burns by the mattress have occurred. Dr. Young believes that some of the burns reported from the use of the mattress are due to the combination of solutions used to wash the patient,—alcohol, green soap, etc. These run under the patient and then on the mattress, and burns result.

DR. JOHN H. GIBBON, in speaking of the effect of air entering the vein while saline solution is being given, related a personal experience met with at West Chester during the past year. The infusion was being given hurriedly after an operation for a perforated gastric ulcer. The salt solution was allowed to run through the nozzle before it was introduced into the vein, but afterwards, through the glass coupling in the tube, a considerable amount of air was seen to pass into the vein. Some untoward result was at once expected, but no bad effect upon the patient was noticed. Dr. Gibbon has heard of the same thing occurring in the experience of other surgeons, and, while he would not consider it advisable to relax every care to prevent the passage of air into the veins, he thinks the danger of this occurrence may have been exaggerated.

DR. HENRY R. WHARTON said that he formerly used the electric mattress and found it of service in combating shock. One patient afterwards had an immense slough eight inches in diameter over the buttocks, however, and since that time he has been very careful in its employment.

#### INGUINAL HERNIA OF THE UTERUS.

DR. JOHN H. JOPSON read a paper with this title, for which see page 98.

DR. JOHN B. DEEVER put on record a case of strangulation of the fimbriated extremity of a Fallopian tube of the right side, which was thought to be a femoral hernia.

DR. JOHN H. GIBBON described briefly a case of left femoral hernia in a woman of seventy years, operated on by him at the

Pennsylvania Hospital. The patient had been operated on some years previous, the later condition being a recurrence. When the sac was opened, it was found to contain the cæcum, with the appendix, the ascending, transverse, and descending colon as far as the sigmoid and the entire omentum. He had previously reported two left cæcal hernias, this making the third. The patient made a good recovery, and had no return of the hernia when she left the hospital. Transposition of the viscera was not present in any of these cases. The two reported cases were left inguinal herniæ.

DR. HENRY R. WHARTON mentioned the case of a woman who was thought to have incarcerated omentum in a right inguinal hernia. She was then four or five months pregnant. Operation revealed the contents of the sac to be a pedunculated fibroid of the uterus. This was removed and the patient went to full term.

DR. JOPSON said that where a hernia of the Fallopian tube was present it was also possible to have hernia of the ovary. He had at first but little hope of curing this patient's hernia, but there were no signs of recurrence several weeks after the operation. There apparently never had been a hernia of the bowel. In answer to a question by Dr. Ross, Dr. Jopson stated that at the time of operation one could not say if the hernia was direct or indirect, but, judging from the history, it was probably congenital and indirect.

## REVIEWS OF BOOKS.

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RÖNTGEN-RAY DIAGNOSIS AND THERAPY. By CARL BECK, M.D.  
New York and London: D. Appleton & Co., 1904.

The author's aim in preparing this work has been to demonstrate how the Röntgen rays can best be utilized in medical and surgical practice.

The great importance of using a compression diaphragm in the production of good skiagraphs is emphasized. The diaphragm used by Dr. Beck is simple and practical, and by its aid it is possible to bring out structural details on a plate much more clearly than without it.

The author has added much to our knowledge of the usefulness of the rays in the diagnosis of biliary and renal calculi. A careful study of his results demonstrates more clearly than ever the necessity of using the very best coil and tubes if one expects to accomplish anything in this branch of the work. The characteristics of a reliable renal skiagraph, the author states, are that it shows the outlines of the psoas muscle, and the lower ribs, and the structure of the transverse processes. If they show distinctly, a calculus which is not smaller than a pea would necessarily also leave its shadow on the plate.

The chapters on Fractures and the Operative Treatment of Deformed Fracture as indicated by the Röntgen rays are especially valuable.

The illustrations throughout the book are most excellent and are well chosen. The work itself is very practical in that the subject has been treated from a strictly clinical point of view.

PAUL MONROE PILCHER.

PROGRESSIVE MEDICINE. Edited by HOBART AMORY HARE, M.D.

Vol. VI, No. 1. March 1, 1904. Philadelphia: Lea Brothers & Co.

This volume contains chapters on the surgery of the head, neck, and thorax; on infectious diseases; on diseases of children; on laryngology and rhinology; on otology; and an index. All of these chapters contain articles on surgical matters.

The article on cerebral pressure analyzes the recent experiences of Kocher, Cushing, and other writers on this subject in the light of the author's own experience. The relation of cerebral pressure to the general systemic blood-pressure is receiving the attention which so important a subject merits. Kocher's four stages of intracranial pressure are clearly defined. The idea of bleeding as a therapeutic measure in cases of intracranial hæmorrhage with high-bounding pulse is purely a symptomatic one, based on the mistaken judgment that the high tension is the cause, when it really is the result of the hæmorrhage. Recent studies have shown that the high blood-pressure serves the salutary purpose of overcoming the anæmia of the bulbar centres, and preventing death from paralysis of the heart and respiration. Every surgeon should be familiar with these observations upon the effects of traumatism and hæmorrhage of the brain in their relation to blood-pressure.

Some consideration is given to the treatment of trigeminal neuralgia by the injection of osmic acid into the substance of the nerve. There is also an interesting discussion of the most recent contributions on the subject of tumors of the cerebellum.

Some idea of the value of the surgical treatment of epilepsy may be gathered from the results in thirty-three cases operated upon and reported by Spratling. These cases have been carefully followed and the results tabulated.

The subject of malignancy of the lip and tongue is discussed in the light of a large number of contributions which have recently come from English sources. One may carry away from this the

impression that the best operations are the most simple. The fancy and complicated plastic operations, preferred for cosmetic considerations, divert the operator from the main issue. Cheate's article, calling attention to the relation between nerve distribution and carcinoma of the face, shows the relation between this disease and the trophic centres. The treatment of chronic facial paralysis by nerve anastomosis is fully discussed. This is one of the most important of the fields of modern surgery, and presents help to a large class of cases.

Tetanus is fully discussed in connection with recent literature. The use of gelatin injections as a cause of the disease and its relation to the blank cartridge are presented. The value of carbolic acid injections is exploited.

This volume is rich in surgical material. From the point of view of authoritativeness, completeness, adaptation to practical needs, good literary style, and availability for reference, the work fills a need and does great credit to all who have had a hand in its making.

JAMES P. WARBASSE.



## CORRESPONDENCE.

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### CERTAIN POINTS IN SUPRAPUBIC PROSTATECTOMY.

EDITOR ANNALS OF SURGERY.

THE paper which was published by me in the January, 1904, number of the ANNALS OF SURGERY has received comments in two or three subsequent papers which show that the purpose of the operation there described has not been fully appreciated.

Dr. Lilienthal, in the May number of the ANNALS OF SURGERY (p. 811), in the course of some very apposite remarks with regard to suprapubic prostatectomy, with which I cordially agree, said: "The writer mentioned that in doing the suprapubic operation there was a likelihood of tearing out a part of the prostatic urethra." Dr. Lilienthal "did not think that accident would occur if the work was not done too hurriedly." The deliberate removal of the prostatic urethra was the main point upon which I desired to lay stress. It is not accidental, but purposeful. I have done many enucleations of portions of the prostate, leaving the urethra intact, but in such cases the results have not been so satisfactory as in the series of cases recorded in my paper. If the urethra be left behind at the time of operation, and a free removal of both lobes of the prostate be accomplished, I am sure that in some cases the urethra subsequently sloughs away and may be recognized after its discharge from the suprapubic wound.

Dr. J. B. Murphy, in the *Journal of the American Medical Association*, May 28, 1904, p. 1413, in a very able paper on Prostatectomy, writes, "From a perusal of his article, however, it is clear that his drainage was not satisfactory, as he frequently resorted to irrigations of the bladder with 1 per cent. carbolic acid solution." The drainage in all my cases was perfectly satisfactory. Suprapubic drainage is certainly more satisfactory than perineal

drainage in cases of enlargement of the prostate. Of this, we have been convinced since McGill's day. The reason for a daily flushing of the bladder is that in all the cases recorded in the paper, cystitis was present, often of a severe type, and the lavage was intended to hasten the return to health of the vesical mucous membrane.

Dr. Murphy further says that suprapubic leakage persisted for about seven weeks on the average. On working out in days the date of healing in this series, I find that in the eleven cases, the closure was complete, in the average, on the thirty-sixth day. In one case, owing to orchitis having occurred, the suprapubic wound did not heal till the ninety-fifth day. In my cases up to date, the average day of closure is the twenty-seventh day.

B. G. A. MOYNIHAN.

LEEDS, ENGLAND.

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#### VALUE OF PEROXIDE OF HYDROGEN.

EDITOR ANNALS OF SURGERY.

I WISH to draw attention to the value of peroxide of hydrogen as a diagnostic help in the recognition of small malignant ulcerations in mucous membranes. I have found it of decided use in the X-ray treatment of rodent ulcers round the eye, when the conjunctiva has become involved. The whitening of the little patches which occurs on the application of the peroxide enabling me to recognize such very early, and preventing me from ceasing treatment too soon, which error I would otherwise have made.

C. M. COOPER, M.B., M.R.C.S.

SAN FRANCISCO, CALIFORNIA.